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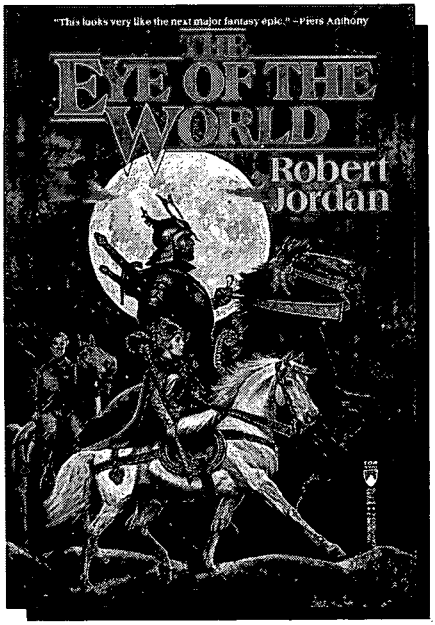

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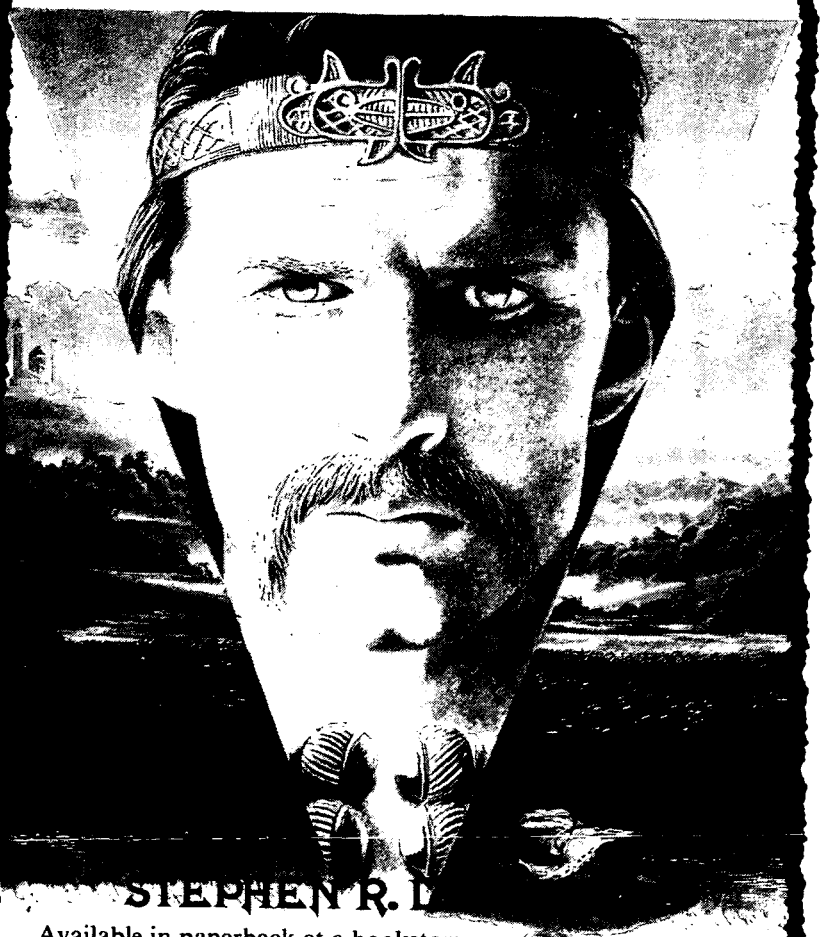

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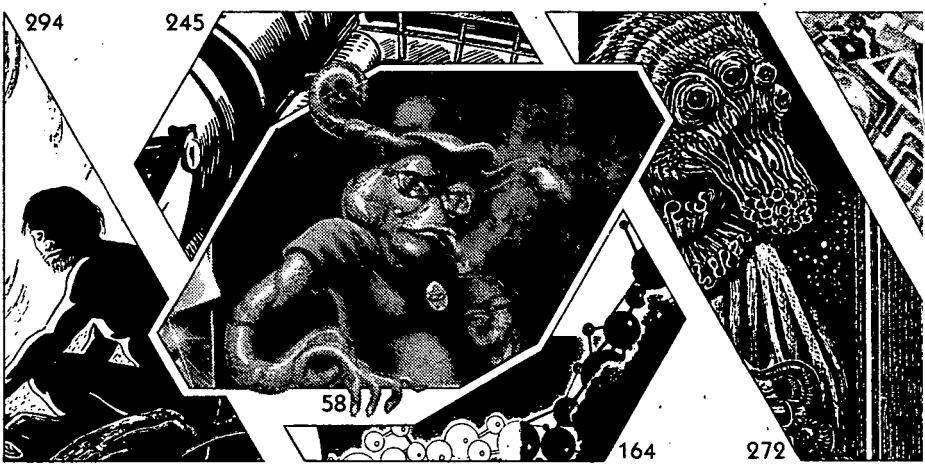

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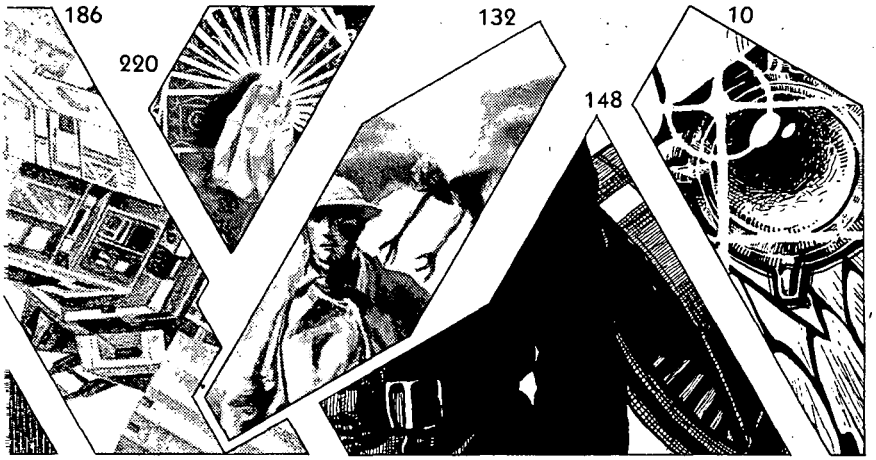

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Editorial

ANOTHER DECADE!

Stanley Schmidt

With this issue, *Analog* is sixty years old—a very respectable age for a science fiction magazine. I know of only one other that can come close to it; and though that one began publishing a bit earlier, it has not come as close to continuous, monthly publication as we have.

You've probably already noticed our special Kelly Freas cover and extra pages. If you've peeked at the Table of Contents, you've noticed several other special features to commemorate the occasion, including some samples of what *Astounding* and *Analog* were doing in years gone by. Kelly Freas also has an article about his views on how science fiction illustration should be done, which constitute a pretty good description of how *Analog* thinks it should be done—and therefore advice worth heeding for any artist who aspires to appearing here. Jay Kay Klein, instead of his usual one-page *Biolog*, has a longer review of many of our important contributors over the years—what they've done and where they are now. Even the science fact article is a bit unusual. Science fiction has long tried to foresee possible futures—*not* to predict which one *will* happen, but to explore lots of possibilities that *could* happen while there's still time to think about them. With that approach, you'd expect both hits and misses, and this month Michael F. Flynn takes a look back at both among the "wild imaginings" set forth in stories and articles by *Analog* authors.

What is this thing called *Analog?* Many of you already know. Among other things, *Analog* is a magazine so attuned to a particular audience (thanks largely to vociferous feedback from readers!) that many of you have stayed with us for an uncommonly long time.

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But some of you have joined us more recently and might be interested in a bit of our background.

Analog first appeared in January, 1930, as *Astounding Stories of Super-Science*. As Harry Bates's first editorial (reprinted at the beginning of Mike Flynn's article in this issue) indicates, the initial emphasis was on scientific speculation. Late in its first decade, there was a change in that, with repercussions through the entire field. The editorship was taken over by John W. Campbell, Jr., a young man trained as a physicist and already enjoying a reputation as not one but two of the most popular writers in the field: himself and "Don A. Stuart," who wrote very different kinds of stories. As editor of *Astounding*, Campbell for the first time insisted that authors place equal stress and attention on both words of *science fiction*. He was still very much interested in scientific and technological speculation, and more than any other editor he insisted that authors take pains to make their speculations both highly imaginative and plausible. But his emphasis shifted away from inventions and discoveries *per se* to their effects on human life, and more than any other editor in this field he also insisted on stories well crafted *as stories*, with characters and plots that went well beyond cardboard puppetry. The result was a magazine that quickly became recognized as the clear leader in the field.

Campbell held the helm for an extraordinarily long time—until his death in 1971. In 1960, deciding that *Astounding* sounded too sensational to give an accurate impression of what the magazine was really doing, he changed the title to *Analog Science Fiction/Science Fact*. (This year, for the first time, we will have been *Analog* longer than *Astounding*!) Many readers were perplexed by the new title, but it was a good description on at least two levels. First, by then *Analog* was routinely featuring fact articles, about subjects on the frontiers of research with big implications for the future, and stressing the close parallels between what was foretold in science fiction and what was happening in the real world. Second, the stories themselves could be considered analog simulations of possible futures, to try them out on paper before subjecting ourselves to them in reality.

Both of Campbell's successors, Ben Bova and Stanley Schmidt, have also been scientifically trained and have continued to place equal emphasis on *science* and *fiction* in their selection of stories for *Analog*. For better or worse, this has not been true throughout the field. About 1950, an impressive diversification began, with the birth of a couple of other magazines widely regarded as comparable in quality to *Astounding*, but with very different editorial personalities. This was a very healthy development. The more choices you have available, the better the chance that some of them will fit your needs, whatever they may be.

However, that diversification in recent years has continued to the point where a great deal of material is published as "science fiction" that has nothing to do with science. Some of it

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I would call fantasy; some I would call mainstream. I have no categorical objection to either; I even like some of the stories. But I think it's a dilution, corruption, and weakening of the language to call them science fiction. To me it seems self-evident that if you call something "science fiction," *science* should be an integral part of it—and by *science*, I mean something that even scientists would recognize as such. That's what readers have come to expect of *Analog*; and it's what *Analog* will continue to deliver, as long as the word *science* appears in our name.

We will also continue to explore a wide range of ideas and options through fact articles, editorials, and columns such as "The Alternate View." New capabilities will continue to bring with them new problems, just as they always have. This is not a reason to shrink from developing new capabilities; it is a reason to think in advance about how you're going to cope with the problems. That requires consideration not only of the scientific facts, but also of goals and values—of what is desirable and achiev-

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able. A good way to get people to think about such things is to present them with alternate viewpoints. Hence, as Kelvin Throop once observed, "Opinions expressed in the editorials are not necessarily those of the editor." We are not pushing an "*Analog* line," except perhaps the underlying belief that the Universe is rational enough that rational beings can and should learn to deal with it. In *Analog*, virtually anything is open to question. We may publish stories, editorials, or columns that take just about any view—as long as they present it cogently enough to invite serious rebuttal. (We do not, of course, want to publish offbeat views merely *because* they're offbeat, and no matter how transparently flawed their reasoning.)

Will science fiction continue to have a reason for existence for another sixty years? I'm quite confident that it will, despite the occasional serious assertion that it has already done all it can. After the first manned Moon landing, twenty years ago, non-science-fiction readers sometimes asked, "What will science fiction write about, now that we've been to the Moon?" Science fiction writers answered by pointing out that few, if any, stories had been written about Moon landings for many years before that. Science fiction had long since gone beyond them, having long recognized (as the real world is only now, and grudgingly, beginning to) that the first Moon landing was the *beginning*, not the end, of something big and important.

Quite recently I was asked, by a highly intelligent person who may or may not have been serious, "If nanotechnology develops as foreseen, will there be anything left for science fiction to do?"

I can imagine somebody asking many thousands of years ago, "Now that we've tamed fire, is there anything left for the dreamers to dream about?" *Our* answer, of course, would be, "Yes!" —but few dreamers available then would have been able to foresee how fire would lead to metallurgy, chemistry, gourmet cooking, and all the profound ways those and their offshoots have reshaped our concept of "human life."

The roles of nanotechnology, starflight, and quite possibly others that not even our writers have yet imagined will be like that of fire—ending one era, but opening up another full of new potentials at best only dimly foreseen. That being the case, there will continue to be *plenty* for science fiction to do, as far into the future as I can imagine.

And *Analog* will continue to play a leading role in doing it—not just dreaming, but *thinking* about what the future might be and how we might best take advantage of it. ■

●Education's purpose is to replace an empty mind with an open one.

Malcolm S. Forbes

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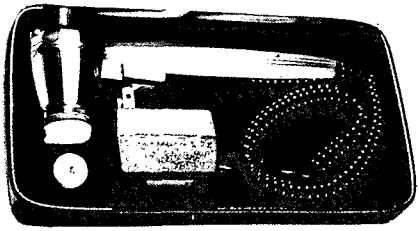

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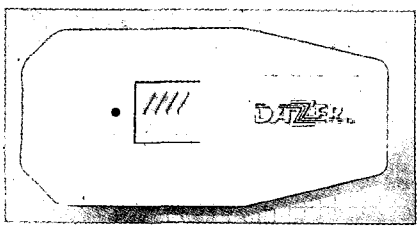

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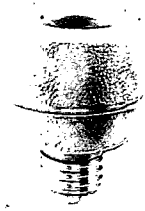

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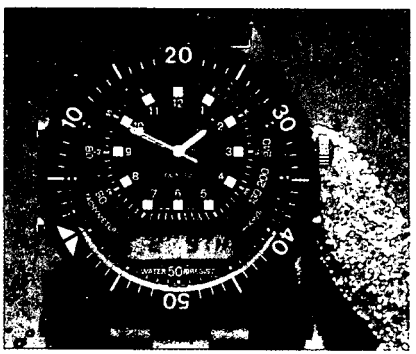

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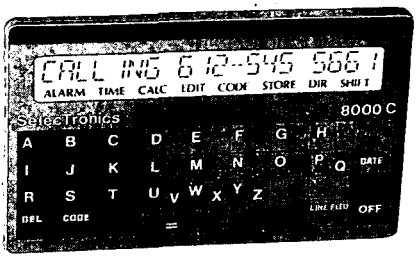
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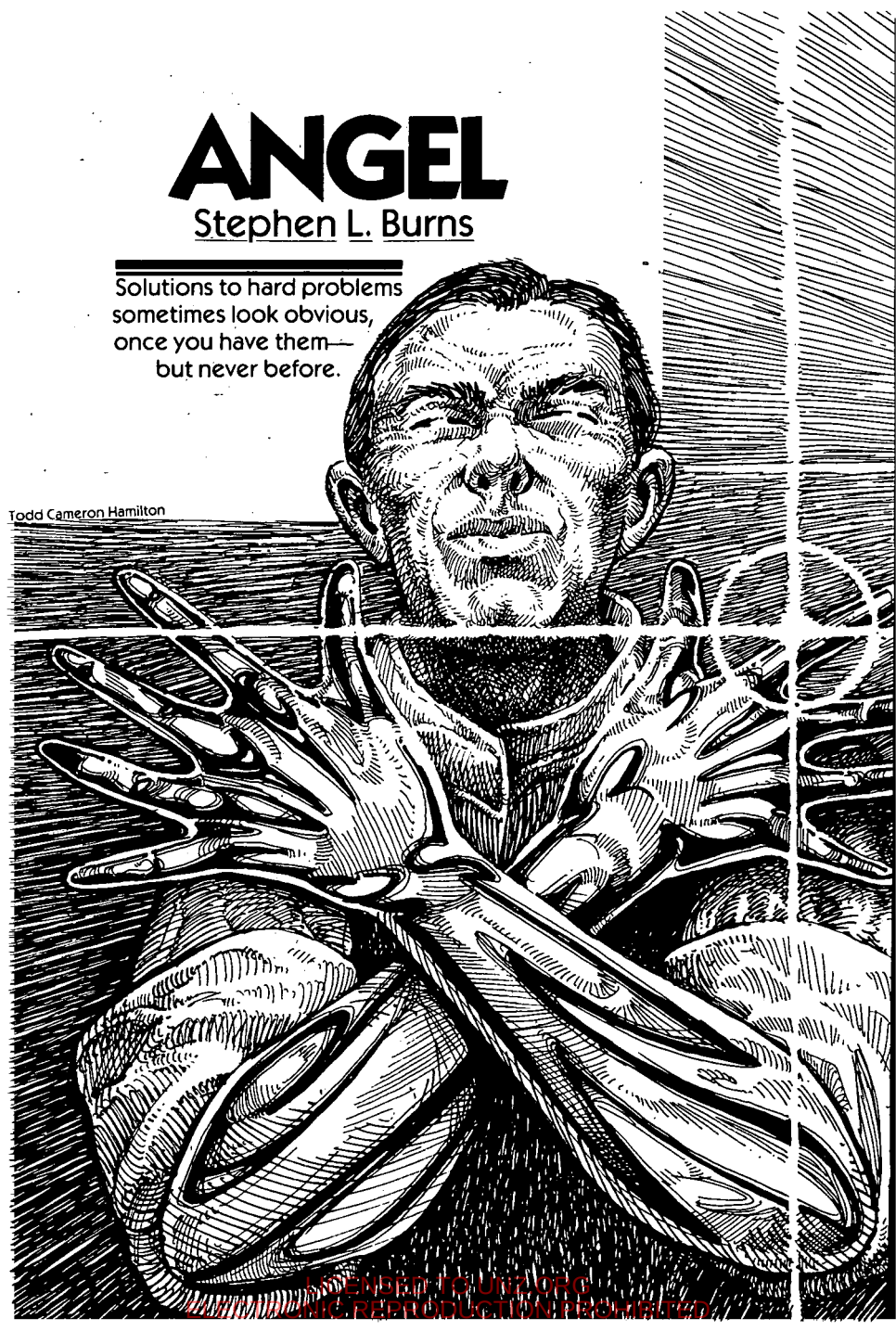
ANGEL

Stephen L. Burns

Solutions to hard problems sometimes look obvious, once you have them— but never before.



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Dr. Georgory Marchey shuffled back to the temporary room he had been assigned in the half-g section of the off-Io hospital wheel. Ionian whiskey was legendary system-wide for its strength and flavor. The legend lived on. He had washed down his dinner with enough to make him move with a slow, exaggerated caution.

That had become his sole criterion for judging the places he was sent: *How was the booze?*

Other than that, one place was pretty much the same as the last, the same as the next. The same sterile stone/steel/ceramic corridors. The same insensible strangers for patients. The same blurred, disapproving faces watching him work, never bothering to hide their impatience to see the pariah finish that work and move on. The same half-heard comments echoing through a past, present, and future twisted into a Mobius treadmill that kept him plodding blindly along in the same place for all the millions of kilometers he traveled.

He already had his travel orders from the Bergmann Medical Institute. Next stop Ganymede.

Queen to King's Bishop 3. The Red Queen, of course.

That made him laugh. But it was a joyless, unpleasant bark that caused a couple waiting for the elevator further along the corridor to turn and stare.

He gave them a smile that made them wonder at his sanity. "Actually," he told them, "I'm more a pawn than a queen."

They decided on the stairs, glancing back over their shoulders and whispering as they moved away.

Marchey had already put them out of his mind. Whispers were nothing new; they were the sound of the blur, signifying nothing. He had reached the door to his cubicle. He peered at the number on the door closely, even though it had been easier to find than most since it was the last door in a dead-end corridor. That was a nice touch. He could appreciate the humor.

B/164/G. Home sweet home for all of four days that ended tomorrow. He would have stayed in his ship, but it had been due for its twice-yearly maintenance check. It was probably ready to go. So was he—but not tonight. He rummaged through his pouch, pulled out his IDChip with a grey-gloved hand, watched that hand face the chip to the lock as if it were some unconnected piece of arcane machinery operating on its own.

The lock chimed. The door slid open. He shuffled in, slapped the plate to close the door behind him. One nightcap—maybe two—and a check to see how his patient was doing. By bedside comp, of course. No sense taking a chance on killing the poor bastard after saving his life.

Now if he could just remember the man's name. . . . Had they even told it to him?

It wasn't until he turned toward the bed that he realized he wasn't alone in the room.

Scylla sat rigidly on the bed, waiting for her quarry to react to her presense. No matter what he did, she was ready. If he tried to run, she would bring him down before he could even get turned around. If he came at her, he would

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quickly learn what it was to dare attack an angel.

But he only stood there, staring at her so expressionlessly that for a moment she wondered if he saw her at all. His face was broad but gaunt; his blunt features looked like they had been eroded out of something not only fuller and younger, but softer and happier. Only a thin, grey-black fringe of hair remained at the back of his head. His dark eyes were flat and incurious; Scylla saw nothing of herself reflected in them. His lips were twisted into an odd, melancholy half-smile/half-grimace that was habitual, judging by the deep grooves bracketing his mouth. He was of medium height, thick-chested and blocky. He looked strong, but his broad shoulders were slumped as if from years of defeating toil.

He appeared to be willing to stand there, unspeaking and unmoving, forever. Scylla was unused to people not reacting to her. She didn't like it one bit.

"You are Dr. Georgory Marchey," she said sharply. "You will do exactly what I say. I want you to sit down. Will you do so, or must I demonstrate what happens if you disobey me?"

Marchey shrugged indifferently, but complied. He dropped heavily into the cubicle's sole chair. "That's an Armark Model 6 Full Combat Exoskeleton you're wearing," he said blandly. "Aside from its armaments, it makes you at least twenty times faster and thirty times stronger than me."

"You have correctly judged my superiority over you," Scylla said tightly, "But do not spout nonsense. I am an *angel*."

Marchey gave her a mordant smile. "My mistake. I always expected my drinking to make me see pink elephants." He leaned over to retrieve a bottle from the table beside him. "Speaking of drinking, would you care to join me?"

Scylla *moved*, the gleaming quicksilver metal skin and sinew of her exo turning her into a living lightning bolt as she came up off the bed and snatched the bottle from his hand faster than the eye could follow. Then slowly, deliberately, she crushed the bottle in one augmented hand. The small room filled with the sharp tang of spilled alcohol.

"No?" Marchey said mildly, staring up at her face. A face that had been tattooed into a nightmarish red and black demon's mask, a face to instill fear. "Or are you just not fond of gin?"

"What is the matter with you?" Scylla demanded, frustration turning her voice into a caustic hiss. "Are you stupid? Suicidal? What are you?"

Marchey stared up at her, his face empty of fear, empty of anything Scylla could name.

"Thirsty."

Scylla was confused. She didn't like it one bit.

Her world was a simple one. People feared her because angels are made to be feared; they are an instrument to make man comply with the Laws of God, and mete out just punishment when those laws are broken. There had only ever been one person who did not cringe in her presense, and that was Brother Fist. As she was his angel, it was only fitting that it be she who feared him.

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But this man was no Chosen of God. He was an infidel, and she an angel. How could he look upon her and not be daunted?

She knew exactly how she looked, and was proud of it. Her body was no unclean mass of soft, sagging, sweating flesh; she was polished, strutted, indestructable silver nearly head to toe. For her, nakedness was no shame. She was not cursed with a woman's shameful parts to hide: her groin was smooth, featureless, and unimpregnable; her breasts were small, and without nipples to mark her as a suckling beast. Her face was human-shaped and of flesh, but it bore red and black God-marks etched into her very pores. Her one green eye was human enough, for angels stand halfway between God and man. Her other, angel eye, was an unblinking glass lens that let Brother Fist witness his world through her, and gave her sight in the darkness so none could escape God's justice.

She shone like a sword, and yet Marchey was not blinded.

He picked up another bottle from the table. She watched him drink, then hold the bottle toward her. "Come on, have a drink," he said. "*It'll help you relax.*"

She took it. He started to withdraw his hand, but she grabbed him by the wrist with her other hand. Her ceramyl talons hissed from their sheaths, razor-sharp points dimpling the soft grey velvet of the glove he wore. Staring him straight in the eye, she squeezed. Not hard enough to crush, but more than enough to wipe that infuriatingly bland expression off his face.

But his wrist was unyielding. The look of apathetic patience he wore never faltered.

Scylla frowned, red-scaled nostrils flaring. She squeezed harder. Hard enough to make him cry out as the bones of his wrist ground together. She was under strict orders to deliver him in one piece, but one way or another, she was going to put him on his knees and see fear and pain in his eyes. Her black-tattooed lips drew back from teeth that had been filed to points and capped with a thin layer of bonded ceramyl.

Marchey cocked his head for a better look. Against all reason, he smiled. "Nice touch," he said. "Bet it hurts like a bastard if you bite your tongue."

Scylla hissed in a fulminating mixture of rising anger and baffled frustration. She dug her claws in and pulled. The velvet shredded like tissue under the ceramyl blades of her talons.

But instead of being rewarded with a scream as his wrist was flayed to the bone, there was a shrill *skreeeeee* that set her teeth on edge as it traveled up her arm.

She looked down. His hand and wrist were silver, a silver not unlike her own angel skin. Her talons were sharp enough to slash through sheet steel like cardboard, but they had not left so much as a scratch on that gleaming surface.

Her quarry grinned up at her. "Surprise."

"Surprise yourself," she snarled.

Then she shot him point blank in the chest.

Marchey came to, shook his head groggily. That was a mistake. His brain felt like it had been sucked out, macerated into a thin paste, and squeezed back

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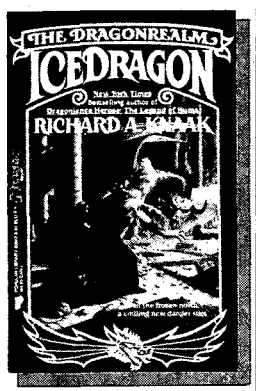

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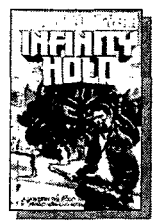

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into his skull through the hole bored in his forehead. He moaned as it sloshed turgidly with every movement of his head.

He heard someone behind him laugh, a harsh and thunderous sound that lanced straight through him. A female someone. His memory coughed up a hazy picture of a one-eyed silver gargoyle.

That didn't make any sense, so he squinted at his surroundings, found himself in the familiar confines of the courier ship that had been his only real home for the last few years. He forced himself to lift his head and focus on the main board.

According to the stack he was in transit.

That was strange. He didn't remember—

"We are on our way to Ananke."

That woman's voice again. Marchey got himself turned around to look at its source. The gargoyle had not been a hallucination. The armor-plated young woman with the hideously tattooed face sat at the galley table. Drinking coffee.

"Good for us," he mumbled, fishing in his pouch for an analgesic. His pouch had been emptied.

She held up the purple foilpak he'd been searching for. "Are you looking for these?"

"Oh yeah." He heaved himself to his feet, grimacing as his brain cells ebbed and surged, then stood there swaying. The silver metal hand with the velvet tatters hanging from it went to his chest. It felt bruised. "I . . . remember you shooting me. Disruptor?" That, plus the booze, explained the monster hangover.

"God's Wrath." Marchey watched the woman's face harden. It was not a pretty sight. "You will feel it again if you give me the slightest trouble."

"Perish the thought." He started toward her. "Can I have one of those," he asked, reaching for the pak she held in one knob-knuckled, silver-armored hand. "Or is this week's special free torture with every kidnapping and ship hijacking?"

She stared at him a long moment. "I am no torturer." She flipped the pak at him.

Somehow he managed to catch it. He popped out a derm, applied it over his carotid artery. He closed his eyes, waiting for the syndorphin to work its magic.

He slumped as every cell in his body uncramped and quit shrieking. He opened his eyes, moved his head experimentally. The brain slop was gone. He was capable of what passed for rational thought once more.

Well, that could be fixed easily enough.

He managed a wan smile. "Thanks. I hope you didn't have to break any sort of kidnappers' rules to do that. Tell me, my dear, do you have a name? Or do you prefer to go by your job description?"

Marchey found that he could tell real anger when it appeared on that hideously tattooed face. It showed in the curl of her black-webbed lips, in the flash of that one green eye.

"Don't you dare take me lightly," she warned, her voice filled with unmistakable menace. "I will make you regret it."

It was no mental feat for Marchey to deduce that being feared was of cardinal

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importance to her. It explained the face, the teeth, the exo, the attitude. He supposed he should be more careful about what he said to her. But when he got right down to it, he didn't really give a damn.

Still, he could be polite. After all, how often did he have company?

He held up his hands in a placating gesture. "I don't doubt that you could tear my head off and eat it for breakfast. I'm not stupid enough to try to overpower you. I'm a doctor, not a fighter. Besides, I once worked in a UNSRA hospital and helped install soldiers in exos like yours. I know how they work and what they can do."

His kidnapper frowned. "You speak nonsense again. I told you before, I am an angel."

Marchey shrugged. "Whatever you say." He slid into the seat across from her, drew a cup of coffee. There was a bottle of brandy on the shelf next to the dispenser. A liberal dollop went into his cup, then he offered the bottle to her. "Want some breakfast?"

She shook her head. "Do you spend all your time drunk?"

"Define *all*." He took a sip of his laced coffee. "Define *time*. Define *drunk*." Another sip. He looked at her over the rim of his cup. "It's a semantic mine field. You could lose a foot just thinking about it."

Not even a hint of a smile. "Are you really a doctor?" She made the word *doctor* sound like it described something strange and ugly, like a lycanthropic zombie pederast. Or worse.

He hunched his shoulders. "I wish I knew." That wasn't a subject he wanted to get into, so he changed it. "What kind of kidnapper are you, my angel? What do you expect to get for me? And are you going to tell me your name, or should I just call you Madame Shanghai?"

"Only one question means anything. My name is Scylla."

Marchey looked interested. "Ah, were you once a fair maiden, now changed into a monster?"

Scylla's frown deepened. "What do you mean by that?"

"Greek mythology." No reaction. "Homer's *Odyssey*. Scylla was a fair maiden who was turned into a monster. Twelve legs like tentacles. Six heads with triple rows of fangs and a taste for sailors. —'God or man, no one could look upon her in joy.' That was poor Scylla after the sorceress Circe was done with her. Circe saw her as a rival for the love of a merman named, uh, Glaucus. Turning her into a monster took her out of that game."

Scylla said nothing. There was no way to tell what—if anything—she was thinking. Marchey's coffee had cooled. He took a long swallow, then asked, "Did someone give you that name?"

"Brother Fist," she said, then suddenly looked confused. A moment later her face went blank, and she sat there staring sightlessly past him like a robot that had encountered circumstances outside the limit of its programming.

His curiosity mildly piqued, Marchey settled back to see what happened next.

Scylla felt a sudden wrenching duality that tore her in two directions and left her stretched over a void.

She had always been Scylla. (*Brother Fist named me.*) She was an angel. (*A*

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blurred glimpse of a face. Frightened. Small and white. In a . . . mirror?) She served Brother Fist. (*Another face. I love you, Angel. Love you.*) Brother Fist spoke God's Will. ((*You are not Angel. Your name is Scylla. Scylla. You are an angel. An angel. You will love me. Love me. You will obey me. Obey me. What are you?*))

An angel! she screamed silently. She was and had always been the angel Scylla! All else was deception! Life was a war against the lies and deceptions made to lure the weak in faith and spirit from the true path. Brother Fist had warned her of that a thousand times. Unholy evil was everywhere, made in the very flesh and marrow of every man and woman, and even an angel was human enough to be prey to it.

Was she too weak for the task Brother Fist had given her? He had ordered her away from her place at his side, forced her to leave the Eden of Ananke and venture into the Profane World to bring this man Marchey back to him. The impious temptation to argue with his edict had been terrible; it went against her every instinct to leave him vulnerable and unprotected.

But he was Brother Fist and she was his angel. His will was always to be done. Disobedience was blackest blasphemy.

So she had obeyed, command deciding the conflict. Deciding, but not resolving. She had risked her life and soul to capture Marchey, that conflict still smoldering like a glowing coal inside her.

It was that ember which made her wonder what possible use this drunken infidel could be to him. That led her to wonder—could Brother Fist have been . . . *wrong?*

At that thought a seething wave of nausea surged through her, hot electric pain riding the crest. Her body stiffened as if galvanized, and the cup she held in her augmented hands shattered as they closed into fists.

A voice shouted a litany at the back of her head. A man's voice; the voice of her conscience. She heaved herself to her feet in numb obedience.

She had shown weakness of faith. She had doubted; not just her self, but the will of God's perfect servant himself.

And so she must atone.

Marchey watched Scylla crush the ceramic cup like so much paper, then lurch to her feet. The blank lens that replaced one eye slid sightlessly past him. Her other eye, the one of the unusual bottle green which reminded him of another woman, another time, another life, was fixed and dilated.

She ratcheted to the center of the deckspace like an automaton, folded to her knees. Out of the utility pouch she wore at one silver-sheathed hip came a palm-sized matte black box. She pressed a catch. Two wires sprang from a concealed compartment. At the end of each wire glinted a long steel needle.

Marchey watched her turn her hands over. There was a small unarmored area of exposed flesh at the back of each hand, the pale, tattooed flesh framed by gleaming silver. Her ink-etched face a stiff, frozen wasteland, she pushed a needle deep into the back of first one hand and then the other. Only the knotting of her jaw muscles betrayed her pain.

She placed the box before her knees,

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the heel of each hand atop the box. After a long moment she leaned forward, putting her weight on her arms. The box began to emit a soft, somehow sinister, humming sound.

Scylla's arms stiffened. Her back, her whole body clenched cable-taut as electricity surged from one electrode to the other with her body as the conductor. She threw her head back, her jaw clamped tight on what Marchey knew had to be a scream.

She inflicted that agony on herself for a slow ten-count, then let up. She muttered a low, monotonous prayer, paused, then leaned on the box again.

Marchey shuddered and looked away. He could guess that she was punishing herself—but not why. He stared into his cup as if expecting to find answers there, then shrugged and drained the dregs of the brandy-laced coffee. He refilled the cup, this time with straight brandy. It wouldn't provide any answers, but it might erase the questions. He'd settle for that.

This cinched his conclusion that he was in the hands of a madwoman. She believed she was an angel, which was bad enough, but in that exo she could be anyone she damn well pleased. He remembered the time he had watched a soldier he'd helped install in an exo like Scylla's take on an even dozen remotely-guided, fully armed Ogre Class tanks with his imped weapons deactivated to even the odds. That one soldier had single-handedly reduced all twelve death-machines to smoking scrap.

It had taken him all of four minutes.

Marchey knew he ought to be scared shitless.

But he really didn't feel much of anything. He took a sip of the brandy, wondering if he had reached the point where he was past caring if he lived or died.

He didn't think so. He tried to examine his apathy objectively, as if it were a mode of dress that had somehow become his uniform, rather than something that covered him more completely, and went far deeper than his skin.

It was probably because this wasn't all that different than his normal routine. His destination might have changed from Ganymede to Ananke, but he wasn't being wrenched off in some radical new direction. Someone else had been in control of his movements for several years now. Someone else chose where he would exercise his special skills, and on whom.

That was probably all this was. In all likelihood there would be a life to be saved, a life that would be either lost or ruined without his intercession. But that life would never touch his, and he would only touch it under strictly controlled conditions. Once his work was done he would be sent away to begin the cycle again; still the endlessly moving pawn in a game of chess where the Black Queen ruled the vast and lonesome board. Her name was *Death*, and his victories over her had become empty, meaningless events; fireflies in the void; fingerprints on glass.

Marchey's right hand, a sculpted metal simulacrum mirror-twinning the one that had surprised Scylla, strayed to the silver metal pin he wore over his heart. What that pin meant to him had changed over the years, but the gesture was a habit that had begun a lifetime ago in pride and hope.

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Brightflash silver, catching the light. The silver metal pin shaped so: Two hands, crossed at the wrists, arms ending just before the elbows, fingers spread wide.

A meter-long reproduction of Marchey's pin hung on the wood-texed wall behind Dr. Salvaz Bophanza's desk, the letters BMI under it in gold-edged black. The man behind the desk leaned forward, his turning rueful.

"OK, I'll cut the small talk—but I really am glad to see you again, Gorey." His smile faded. "I recalled you because things aren't working out very well the way they stand."

Marchey sighed. "So it's not just me. I didn't think it was, but I hoped so anyway."

Salvaz Bophanza had aged. The glowing dark-copper skin Marchey remembered from years gone by had dulled, and what had once been a wild black mane was now a dwindling grey fuzz. His face had thinned, and he wore the resolute, resigned air of the captain of a sinking ship. As Director of the Bergmann Medical Institute, that was uncomfortably close to his job description.

Bophanza shook his head wearily. "No, it's all of you. You were part of the first crop of Bergmann Surgeons. Now it looks like you'll be the last crop as well. The medical establishment refuses to adjust to you, to what you can do and how you do it. You can save lives where no one else can, but they don't want you around before or after they need you. Not one of you has ever ended up on staff anywhere."

He came out from behind his desk, began to pace. Marchey sat sprawled in his chair, waiting patiently. This was old news. He knew Sal was working his way up to something.

"It really pisses me off," Bophanza went on, his voice dripping disgust. "They'll use you when they don't have any other options, but they treat you like pariahs before and after. The word on how you're treated and thought of has gotten around well enough that we haven't had a new applicant in over five years."

Marchey shrugged. "That's probably for the best. I heard Sara-Lyn Neff, Josiah Twotrees, and Grace Nakamura all killed themselves. Is it true?" *Three out of thirty-eight.*

Bophanza's face fell. "It is. So did Ivan Kolinski."

Four. Marchey shook his head sadly. "They were all damned good doctors." Ivan had been an incorrigible practical joker. It was easier to imagine him playing dead than being dead.

"The best. But they simply couldn't handle the way things have turned out. Ivan's death was the worst because it was partially our fault. We brought him back here after he gave himself a near-fatal drug overdose on Cassandra Station. We had to make him stop practicing. He'd just gotten too erratic to be trusted."

Bophanza stared at his hands as if that death were on them. "He stopped his own heart. He left a note. It said the work was killing him by inches, but without it he was nothing, and had nothing left to live for." He looked up at Marchey with haunted eyes. "He said that he knew why we made him stop,

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and he didn't blame us. He . . . *thanked* us . . . ''

''I can understand that,'' Marchey said shortly. He shifted uneasily in his chair, thinking about what it was like to be in a place where being driven to suicide felt like a mercy.

He sat straighter, trying to put such bleak thoughts aside. ''I know that you know what's happening to us, Sal. All I have to do is look at you to see that it's eating you alive. But I doubt that you called me back so we could compare our beds of nails. I'm here. What happens now?''

Bophanza looked relieved to leave the subject of Ivan's death. He draped one long leg over the corner of his desk. ''After some testing and counseling you go back out. But we think we've found a way to make the best of a bad situation. I guess you could say you're about to become a medical hired gun. Since you and the others are forced to move from place to place, you are each being assigned a high-speed UNSRA courier ship so you can do it faster and more efficiently, without depending on the schedules of the regular carriers. The ships are fully automated. We'll handle logistics and itinerary from here. See, UNSRA agrees that your skills are too valuable to be wasted. What you can do is still in demand—''

''But we're not.'' Marchey thought for a second. ''We can cover a larger area this way. And the ships will give us at least the illusion of having a place we belong, right?'' He watched his old friend nod. ''Good PR. We're constantly on the move to serve the greater good, not because we have to. High-speed house calls in a back-assward ambulance.'' He shrugged. ''Why not?''

Bophanza leaned closer, his face intent. ''It's still not going to be easy. But . . . the couriers are big enough for two . . . '' He let the implication dangle like a baited hook.

Marchey snorted. ''Then I'll have lots of elbow room.'' His voice dropped lower. ''So you're admitting that we've turned ourselves into nothing more than pieces of specialized machinery to be passed around on a rotating basis.''

''No, dammit, that's not true!'' Bophanza snapped. ''You're a *doctor*, Gorey! A goddamn good one! You and the rest of the Bergmann Surgeons were some of the brightest, most dedicated doctors—''

''*Were* is the operative word, Sal.'' Marchey spoke softly, but with steel-clad certainty. ''I used to be a doctor. I remember what it was like. Doctors don't give their patients nightmares. Doctors treat people. I haven't met one of my patients in years. They're not *people*. They're diseases. Traumas. Faceless, interchangeable, dysfunctional units. Unconscious meat machinery it's my job to repair. I know what I've become. Just a meat mechanic. That's all. Nothing more.''

''No,'' Bophanza said stubbornly, ''That's not true.''

''Bullshit!'' Marchey realized he was getting angry. But not at Sal, who had troubles enough without being put in the position of Marchey's emotional punching bag.

He stood up and laid one gleaming silver hand on the other man's shoulder. ''I remember when you flunked the final tests and they wouldn't let you give up

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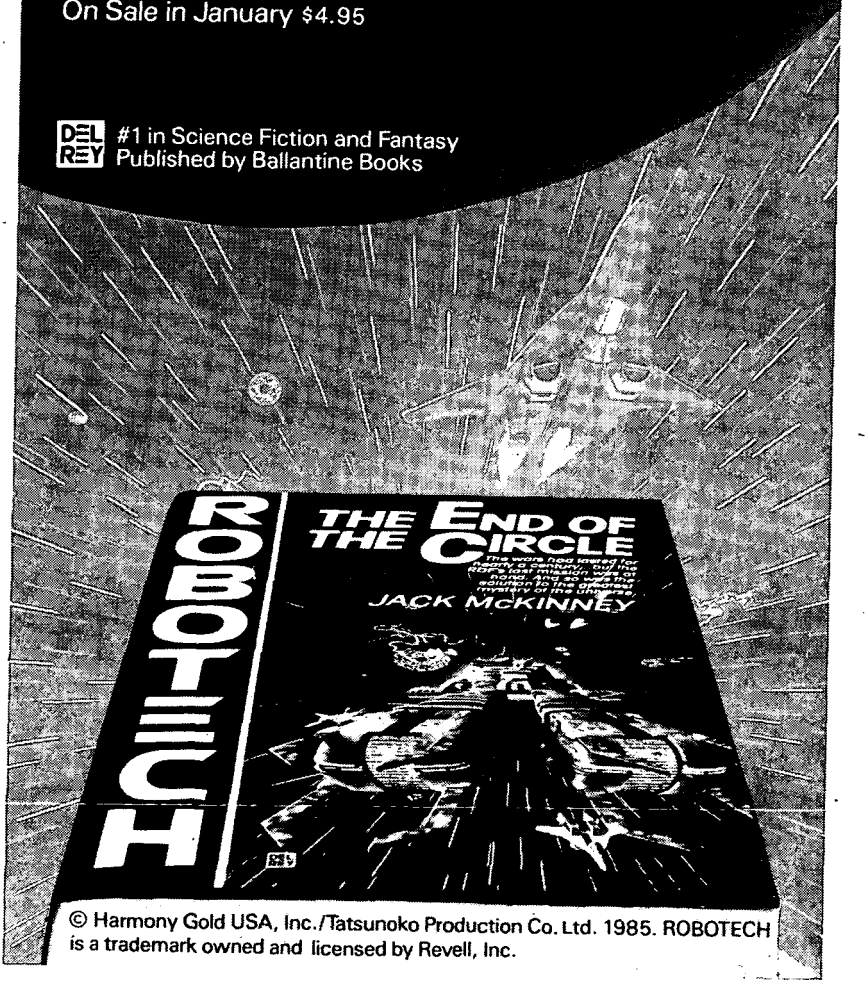

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your hands, Sal. I remember how disappointed you were. There was already a lot of heat on us then, a lot of doubt about what we were trying to do. I know how easy it would've been for you to repudiate us and what we were doing to make yourself feel better about being washed out. But you kept on believing in what we were trying to accomplish. You stayed to work on staff, to help others realize the dream even though it was denied you."

"You don't know how close I came to quitting," Bophanza said softly.

"But you didn't, and now you run the place. Your dream soured, but you kept on serving it anyway. That's what's happening to us. We gambled our hands on the chance to become better healers. We gained an incredible skill, but lost everything else in the bargain. But we're keeping on because it's all we have left. We can still be useful, and maybe someday. . . ."

He let his hand fall. "I'll accept the way things are. The way they have to be. It's that or give up completely. But there's one thing I want you to do for me, all the rest of us poor bastards who gambled and ended up losing after all."

Bophanza met Marchey's gaze squarely. "Name it."

"Remember the dream for us, Sal. I doubt we'll be able to. Keep looking for a way to make it come true after all."

Bophanza nodded solemnly. Then he wrapped his arms around Marchey and held him tightly.

Marchey stiffened and almost pulled away. But after a moment he relaxed and returned his old friend's embrace, allowing himself to remember how it felt to have someone care.

Marchey's hand fell.

All that remained of the dream was life as a tool. The endless shuttle from job to job, and in between a silence and emptiness as great as the gulf between worlds. Alone. No home other than this ship.

He had been a prisoner in it long before Scylla took him and it over. She was just someone else who wanted to use the tool he had become.

She was still praying and performing her masochistic ritual. But he was willing to bet she would abandon her devotions were he to approach her or the ship's controls. Not that he planned to do either. There was no point to it.

He was being moved to another square. But black square, white square, it was certain to be like the one he had just been taken from. Every part of the board was the same. The game never changed. So why should he care about the who and where and why?

What was the difference between indifference and defeat?

Indifference was an empty cup. Defeat was no cup at all.

His cup was empty, the spirits gone.

So he refilled it.

And smiled.

See how easy it is to take control of your life?

The angel was in purgatory. The closer they came to Ananke, the more keyed-up and fretful Scylla became.

Her charge was in an unresponsive stupor; had been since the day before. But she had not dared relax her vigi-

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lance. Two days cooped up with him, and staying ready for action that never came, had left her frustrated and edgy. The trip from Ananke to Io had taken six, but seemed shorter.

At first she had come to the conclusion that Marchey was dead inside. People whose spirits had broken were not rare on Ananke; not everyone had the faith or inner strength to tread the hard road to perfection. She had decided that his cryptic, sometimes sarcastic comments were nothing more than echoes of what he had once been, like ghost data from a wiped program.

But the day before her opinion had been forcibly revised when she had accidently roused him from his apathy.

He had been stretched out on the lounger, listening to music and drinking steadily. Boredom had set her to pacing the narrow confines of the ship's single deck. Looking up, she saw a storage compartment she didn't remember having checked when she swept the ship for weapons.

She unlatched the door to check it out.

Inside was a bisque-fired clay sculpture, the clay the color of old ivory. She took it down for a better look. It was exquisitely made, and radiated a raw emotional power that caught her unawares. The harsh lines of her face softened as she stared at the thing in her hands.

It depicted two sculptors who had begun work on a single life-sized piece: two lovers embracing. But one sculptor stood off to one side, staring grief-stricken up at the unfinished lovers. His arms lay at his feet, and he held his truncated stumps up toward them as if in supplication. The other sculptor, a tall, thin woman, huddled on the ground near him among her abandoned tools. Her face was filled with such shame and frustration that Scylla felt almost like a voyeur looking at it. That face was turned away from fellow sculptor and work alike.

The lovers were rough-hewn and unfinished. But Scylla could see that the man's face was Marchey's. The armless sculptor was Marchey as well.

She frowned at the unfamiliar emotions the sculpture aroused. And what was Marchey doing in it? She turned to ask him.

When he saw her holding the sculpture his face went a terrible bloodless white. He made an awful, tormented sound that was something between a sob and a snarl, and launched himself at her, his silver fingers hooked into claws.

But he had spent the whole day drinking. He stumbled as his feet hit the decking and went crashing to his knees.

Scylla had already braced herself to fend off his assault, angel reflexes slowing time to a crawl as she waited for him to get up and come at her.

But he only knelt where he had fallen, huddled in on himself in heaped misery. He began to weep, begging her not to hurt it. He kept repeating a name. *Ella.*

Brother Fist's angel knew that she had found a weapon to use against him, a soft spot in his seamless apathy. That was good.

But for some reason whose rhyme escaped her, she had gently returned the sculpture to its niche. That was when she saw the name *Ella* carved into its underside.

Then she had told him that it was back

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where it belonged, and promised that she wouldn't hurt it. *Promised.*

Everything was slipping out of her control. It was as if a small puncture had been made when Brother Fist sent her away to fetch Marchey, and became an ever-growing rent upon finding him.

He wasn't afraid of her, even though just the sight of her was enough to put the people of Ananke on their knees. He didn't care that she had taken his life in her hands, and was unconcerned about where she was taking him, or for what purpose. He no longer disputed her angelic state, yet she had the uneasy feeling that he was just humoring her.

But the worst of it was that even though he said and did little, somehow his very presense made her think forbidden thoughts, made her act in ways no angel should. It was as if he was some sort of mirror; one that reflected back hidden faces of her self while distorting the familiar all out of recognition. Fragmenting her.

Where had the silver armor of her certainty gone?

She knew that her only salvation lay in returning to her place at Brother Fist's right hand. He would make things right again, just like he had when—

Scylla frowned as the echo of another almost-memory whispered through her mind; a taunting, impossible unremmberance of a time before she was an angel, when—

Her augmented hands dug into the galley's tabletop, the hard plastic furrowing and tearing like soft putty. Her black-webbed mouth tightened into a thin, hard line.

Deceptions. On every side, even on the inside.

It was being away from the Eden of Ananke, away from Brother Fist's side that had exposed her to all this doubt and deception and confusion. He should never have—

Her one human eye closed. How had she fallen into such a morass of forbidden thoughts? How had her soul become so stained?

She must atone. That knowledge—that *commandment*—tolled in her mind in a voice as great as God's. It was deafening, irrefusable.

But something inside her clenched as tight as her silver fists. There would be no atoning this time. If she was failing a test of faith, the blame was not hers alone.

Refusing to atone brought real physical pain, the imperative was that deeply and inextricably woven into the deepest fiber of her being. But enduring that pain was a kind of penitence of its own. That thought allowed her to ignore the message burning in her nerves.

The doubting angel endured her torment, counting each moment until she returned to Eden as an eternity.

Marchey had come to the conclusion that Ananke was not a very friendly place. They had achieved orbit around it, only to be warned that under no circumstances were ships allowed to land there. All incoming and outgoing cargo was to be picked up and left off at their orbital doorstep.

Scylla had given an override command that had let them land after all. She told him that his was the first outsider ship to do so in over nine years. Somehow he did not feel particularly honored.

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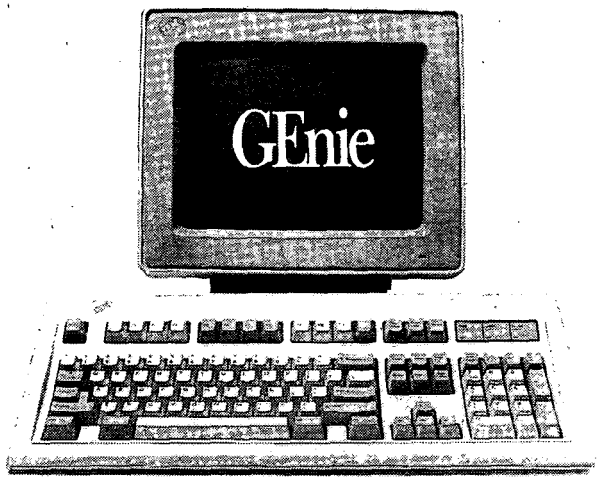

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They made their landing, settling into an open-shuttered steel blister on Ananke's pockmarked surface. The shutters had closed over them like the jaws of a huge trap.

A battered, often-patched locktube blindly sought their lock like an ancient, eyeless lamprey. It finally found its mark and locked on. His airlock had begun cycling, flashed orange, aborted. Marchey had to acknowlege a warning about poor air quality before it would finish its cycle.

The door hissed open. The first thing to hit him was a staggering wave of foul-smelling, poorly scrubbed, over-used air. Scylla prodded him from behind, sending him out into its source.

The detoxtab he'd taken earlier left him feeling wrung out, his senses overacute and his nerves like bare, overheated wires. Every instinct screamed against leaving the safety of his ship.

He pulled himself through the creaking tube, silver hands clamped tight on the limp guideline, further uneased by Ananke's negligible gravity. His ship was gravved, as were most of the places he worked. Sex in loG might be a delight, but most medical procedures worked better in at least .5G. Standard surgery was especially nightmarish in loG. For example, rather than pooling blood tended to cover everything like a thick coat of paint. That wasn't a problem for him, but still he preferred weight to weightlessness.

He cleared the end of the tube. There were perhaps a dozen people in the cold, dimly-lit bay; shadowy figures dwarfed by the orbital containers they were working upon. They started toward him, and something about the way they moved reminded him of the street beggars he'd seen years ago back on Earth. In another lifetime.

He watched them draw closer. His eyes had almost adjusted to the gloom enough to let him see them clearly when Scylla emerged behind him.

Much to Marchey's bewilderment, they cried out and flung themselves to the rocky floor. He turned to see her gazing out over them, nodding approvingly.

"Yes, Brother Fist's angel has returned," she called out, her voice echoing hollowly off the stone and steel walls. "Stand and welcome her back into your love."

Scylla took his arm. One by one the people below struggled to their feet and formed a double row before them. Most had their heads bowed and their hands clasped loosely before them—those that could.

They started down. Marchey's eyes had adjusted to the dim lighting by then, and what he saw chilled him. Every one of them had the gaunt, haggard look of a concentration camp victim. The best dressed among them wore little more than rags, even though the temperature in the bay had to be in the single digits.

And every one of them was in one way or another crippled.

They came abreast of the first in line, a tall man with sad, downcast eyes. He was missing one leg, and leaned on a homemade plastic crutch. The hand on the crutch-brace was a misshapen, two-fingered knot. The face of the woman next to him was a mass of purple-black scar tissure wrapped around one brown, fearful eye. Similar scarring covered her neck and disappeared down the front of

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her greasy torn coverall. Marchey did not need to see the few dry strands of hair left on her head or the tremors that shook her thin frame to recognize the marks of severe radiation exposure. Nor was she the only one similarly afflicted.

He ached to reach out and wipe the pain away, to see if her face could still be found underneath the horror. It looked like he had his work cut out. He turned toward Scylla. "Unless you have a very good clinic—which doesn't look likely—I can treat these people better on my ship. Are they the only cases?"

Scylla stared at him. "You are here to see Brother Fist."

"Then I'm supposed to heal him first?" Marchey told himself that this Brother Fist character had better be in rough shape if he was putting himself in line before these poor bastards.

She scowled. "Brother Fist is God's Chosen. He tells us that secular medicine is a cheat and a deception, a blasphemous affront to God's Will. He needs nothing you can offer. These people will be healed if their faith is strong and their obedience perfect enough."

They had proceeded along the path of misery to draw even with a boy of perhaps twelve. Both his hands were crudely bandaged with dirty rags. Where one of his eyes had been there was now a black-crusted, infected socket. The boy's drawn face was flushed and beaded with sweat. The whole area around his eye was an angry red, and so swollen the tight and shiny skin looked ready to burst. Under it was a glistening tear-track of pus.

Marchey felt fury ignite in a place where there had only been cold ash for a very long time.

He glared at Scylla. "Listen," he grated, his voice dripping anger and contempt. "That boy's eye is badly infected. He is going to fucking *die* unless he gets proper care. Your Brother Fist is full of *shit* if he says—"

He never saw it coming. The world suddenly exploded, blowing him off his feet. He pinwheeled backwards, slamming back-first into one of the orbital containers. He hung there as if glued to its cold steel side, the wind knocked out of him, dazed and desperately gasping for breath.

Ananke's feeble gravity never had a chance to claim him. Scylla swept down on him in two furious strides. She grabbed him by the front of his tunic, her ceramyl claws raking across his chest like razors. She peeled him off and jerked him close. Rage turned her tattooed face into that of a Chinese dragon. Her breath steamed in the frigid air like smoke.

"*Never* speak of Brother Fist like that again," she hissed, her black-webbed lips peeling back from her serried teeth. "My punishment will not kill you," Her one human eye narrowed. The blank lens that replaced her other eye stared at him with machine-cold menace. "Because death would be a mercy."

She slammed him onto his feet. Marchey staggered, but managed to keep from falling. Blood from his slashed chest stained the pristine white of his mangled tunic. He was able to breathe again, and sucked the foul air in greedily. It tasted almost sweet.

He was hurt and scared, but his anger still outweighed his fear. He gathered the shreds of his dignity about him and stared up at Scylla. "Your objection is

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noted," he panted, "But mine still remains."

Scylla's mouth twisted in fury and she raised her taloned hand. But before she could strike again, a clotted, rasping amplified voice rang through the cavernous bay.

"*Scylla! Bring the infidel to me now.*"

The crippled people of Ananke fell to their knees. Scylla went rigid as a statue, her armored hand and arm cocked over Marchey like an axe. Anger and something Marchey could not name warred across the nightmare landscape of her face. For five endless, terrible seconds he was sure that she was going to disobey and he to die. But in the end she shuddered as if struck, and let her hand fall. She bowed her head. "I hear and obey, Brother Fist." Her voice was low and meek. Fearful.

"*Of course you do. Now hurry. I wait.*"

Her head came up, and she eyed Marchey coldly, pointing to the door at the end of the bay. "Move."

Marchey decided not to press his luck, silently obeying her order. He was caught between Scylla and the Charybdis of Ananke, and now he'd had a taste of what Scylla could do to him.

He kept his back straight and did his best to hide the sense of dread that gripped his heart with cold, scaly hands. If what he'd seen so far of this bizarre theocracy was any indication, this was just the first circle of Hell, and the worst was yet to come. He knew there was no way for him to guess just how bad it might get. Humanity—and wasn't that an ironic descriptive?—had long ago proved that when it came to the practices of cruelty and oppression, its inventiveness was nearly infinite.

He knew one thing for certain. He was no longer trapped on his old, endless treadmill. Now he trod a dark and uncertain path that very well might be one way.

Scylla's metal-shod feet made a sound like the slow ticking of a bomb against the wire-mesh covered stone floor of the tunnel. Her face was as set and grim as a granite gargoyle's, a bulwark against the hellbroth of conflicts and pressures boiling inside her.

She had come frighteningly close to giving in to the rage and frustration pounding at her insides and killing Marchey. Killing didn't frighten her. Sometimes that was an angel's duty; God's sword was edged to draw blood. But Brother Fist had ordered her to deliver him unharmed. She had come within one furious heartbeat of failing him.

Of *disobeying* him. The sin of disobedience was cardinal and unforgivable. The fact that he had provoked her would mean less than nothing. She was an angel, and her obedience was expected to be more perfect than that of intrinsically corrupt human flesh.

She stared at her captive's back, watching him shuffle carefully along the patched floor on over-sized magnetic slippers. Although she had spent over two days with him, she knew she could come nowhere near predicting his actions or reactions. She had very nearly killed him, yet he had only reacted with a peculiarly fearless quiet defiance. But his anger over the state of people who meant nothing to him had been real enough. There was anger in him after

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all, perhaps in measure to equal her own. Still the how and why of that anger remained a baffling mystery.

Brother Fist had not revealed what he wanted from this man, and she had to acknowledge the possibility that he might want to speak to him alone. But Marchey had proved that there was no way she could trust him.

Brother Fist had not seemed quite himself of late. He said that the Hand of God was heavy on his shoulders. Was it possible he might overestimate his ability to control this strange, unpredictable man?

She certainly had.

Just thinking that Brother Fist might be wrong about anything brought back the seething nausea, filled her head with pain. Such thoughts were unworthy. Forbidden.

But she had become used to enduring that pain, and now it served a purpose. She was his angel, his guardian angel. His sacred person was to be protected at all costs. Pain was a small price to pay, when her life and soul were already pledged to that duty.

Scylla knew where the hidden cameras covering this section of tunnel were mounted. As they moved into a blind spot she reached into the pouch at her hip and pulled out one of her Ears. It was a thin, transparent chip the size of a fingernail; perfect for being hidden in the homes and workplaces of those suspected of ill-faith or blasphemy.

She scraped her finger across its back to activate the adhesive, carefully keeping her angel eye averted in case Brother Fist was watching through it. By the time they came in range of the next camera, the Ear was stuck tight to Marchey's belt.

The angel permitted herself a small, secret smile. She was taking a risk, but now she could do her duty and guard her charge whether he thought he needed it or not.

Marchey hurt. More every minute.

The slashes across his chest were lines of fire. His back felt like one massive bruise. He could feel his lips ballooning up, and his jaw felt half unhinged. He moved it experimentally. At least it wasn't broken.

He'd been lucky back in the landing bay, and knew it. Scylla had only backhanded him, and pulled her blow at that. Her exo gave her enough strength to have literally knocked his block off.

Some angel. It would have been funny if it wasn't so tragic. He was beginning to think she might be just another pawn in whatever ugly game was being played on Ananke. Someone—this Brother Fist character, most likely—had turned her into a killing machine, and somehow brainwashed her into believing she was an angel. That explained her flat, knee-jerk responses.

He wished he'd spent the time coming here trying to find the woman hidden inside that demon-faced, silver-metal monster. But he had not bothered, had he? Such matters had exactly nothing to do with him, right?

Sure. Besides, why think when you could drink? It appeared that she wasn't the only one operating under flatworm-simple programming.

He told himself that he could at least pay more attention to this 'new Eden' Scylla had brought him to. His life

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might—and probably did—depend upon keeping on his toes for a change.

The picture was unrelentingly grim. The cramped tunnels were cold and poorly lit, the floor-grid patched and curling, dotted with small drifts of rock-fall from the unsealed walls and ceiling. The air was only minimally breathable. Not only did it stink of sweat and poorly recycled waste, it also seemed saturated with a thick, suffocating miasma of fear, despair, and misery, like the air in a prison.

Other than those poor bastards in the ship-bay, he'd seen few of the inhabitants of this so-called Eden. Those they had encountered had either shrunk away from him and his escort, or scuttled back out of sight like frightened mice.

If this was Eden, then it was of the sort created by such infamous Utopians as Jim Jones, Pol Pot, Josef Stalin and Col. Gerald Van Hyams, to name just four. He didn't need to see the mines to have a good idea of what sort of conditions these people worked in; he'd already seen evidence of enough mining accidents to close down any normal operation.

Human life was as cheap as dirt here. 'Service to God' was the name of the game, and the rules were from that old, old practice named Slavery.

It had been quite a while since Marchey had felt anything like real anger or fear. It had been quite a while since he had really felt much of anything at all. But much to his surprise, he found that the machinery was still intact, the rusty gears grinding faster and faster.

Scylla stalked along beside him now. He glanced at her, finally wondering why she had brought him here. Did she really know, or was she just unquestioningly following orders? That seemed the most likely.

She had been sent for him, specifically. He was a Bergmann Surgeon: nothing less and nothing more. His kind were capable of things far out of reach of other doctors, things that had in the end rendered all his other skills useless and unusable. It was a vacuum-sealed certainty that he had been kidnapped because of who he was and what he could do.

According to Scylla, this Brother Fist clown preached an anti-medicine line. She seemed to have swallowed it whole—even though she was the one bringing a doctor to him.

Marchey knew he shouldn't be surprised. Fanaticism and blindness nearly always went hand in hand; they were ultimately different faces of the same spurious coin. He was tempted to point out the contradiction to her. But he was able to make an educated guess that her reaction would be violent.

He wondered if this Brother Fist had taken into account the chance that she might find out he was lying to her.

Another glance at her, superhumanly quick and strong in her indestructable silver exo, and he knew that he didn't want to be there if that happened.

Scylla punched in the codes that would unlock the massive steel door, codes only she and Brother Fist knew. Hope and fear and doubt and confusion overfilled her, making it hard to concentrate on her task.

It would be good to be back at his side. Back where she belonged. The ten days she had been gone felt like an

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eternity. She knew that she had somehow been subtly changed by being away from Ananke for the first time in her life. It seemed a different place than the one she had left. Smaller. Dirtier. Oppressive and almost . . . ugly.

She shook her head to clear it. *Deceptions.*

Even an angel's heaven-made flesh was weak. The doubts that plagued her were proof of that. What should have been a joyous homecoming was under a pall of apprehension because she would have to go before Brother Fist burdened by her sins, doubts, and weaknesses.

She could not help but be afraid that he would see the black stains on her soul the moment he laid eyes on her. He would be deeply disappointed in her, perhaps even angry that she had failed his trust in her.

Even if he did not see her failings, she knew she would have to confess them. No matter which way her sins were revealed, she would have to be punished to atone for them.

Such a punishment would be just, but terrible. She had delivered many such punishments, and knew how high the price of redemption could be set. Scylla was an angel, still she was close enough to human to want to run and hide from what she faced.

But her silver fingers danced across the keys, inputting the sequence that would open the door as if they knew that the only answer was, as always, perfect obedience.

God punishes because he loves. To hide from his punishment was to hide from his love.

The final key was pressed. The huge door yawned open to admit the fallen angel and her charge into the anteroom of the place of love.

"Sweet Jesus in a bank vault," Marchey muttered, watching the huge armored door slide ponderously back. It looked like a tacnuke would make about as big a dent in it as an exploding cigar. Brother Fist put quite a bit of faith in the love of his flock, didn't he?

Scylla took him by the arm and drew him inside. The door rumbled shut behind them, closing with a massive and absolute finality. He sniffed the air. It was sweet and clean, the oxygen content above normal. *Separate life support.* Brother Fist was a cautious man. A man of the people, too.

Marchey found himself being led through an arched vestibule and into a wide rotunda under a high vaulted ceiling. Graceful pillars outset from richly carved walls bracketed the broad metal-traced mosaic floor. At the far end a white stone altar table and carved stone pulpit on a raised dais confirmed that it was a chapel.

He looked up at the source of the golden light flooding the chamber. It came from a glowing one-meter sphere at the center of the ceiling dome. The globe was the Sun, and around it smaller spheres of the planets and moons, each rendered in tinted glass, wheeled in their endless dance.

But he was given no time to appreciate the loving artistry that had gone into the chapel. Or to try to understand the melancholay air that permeated the place; a feeling of disuse; of misuse. Scylla tugged at his arm in obvious impatience.

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"This way." She towed him toward a gilt-framed door between two pillars on the right. A last glance over his shoulder gave him a closer, better look at the altar.

Cold crawled into the marrow of his bones when he saw the thick leather straps which had been clumsily, but securely attached to the altar table.

Scylla wrenched him around to face her. "You are going to meet Brother Fist now," she warned in a low, hard voice. Her face was an unreadable mask. "If you are disrespectful, I will punish you." She dug her augmented fingers into the meat of his upper arm. "If you make any hostile moves toward him I will strangle you with your own guts."

Marchey shivered, knowing that she meant every word. But he was damned if he was going to give her the satisfaction of showing her his fear. He forced a smile, even though it made his mashed lips smart and begin bleeding again. "So you're in charge of protocol, too?"

She snatched him up off the floor and shook him until his teeth rattled. "Understand me, little man! Even if you are alone with him I will know what you say and do. I am an *angel!* You would do well to remember that. If I come after you, there will be no escape, and no mercy when I bring you down."

She shook him again, nearly wrenching his arm out of its socket, then pulled him close. So close that he could see every red and black line on her face, could count her serrated teeth. "I will send you to Hell, skinless and screaming to die if you do one thing wrong. *Do you understand me?*"

"I . . . do," he whispered, desperately trying to stave off the terror sweeping over him. Maybe she saw through the tissue-thin remains of his self-control and knew that she had at last well and truly frightened him—though he hoped not. She threw him down. He staggered drunkenly, but somehow kept from falling. She touched the ornate gold sunburst beside the door.

"Scylla?" came the rasping, clotted voice he had heard in the landing bay. That voice did nothing to ease his fear.

"Here, master."

There was the sharp *clunk* of a lockbolt withdrawing, then the door swung open. It had been backplated with three inches of steel-wrapped, reinforced foamstone.

The first thing to hit Marchey was the smell. It came rolling out in a turgid, gut-twisting wave. It was a smell he knew intimately, one that could slice through the strongest hospital disinfectant like a scalpel through a rose petal.

It was the stench of something long diseased and dying.

Scylla froze on the threshold, nerves shrieking a warning.

Nostrils tattooed with scales and barbs flared. *What was that smell?*

But she already knew the answer to that question: Brother Fist. Then why did it seem like such a stench now? Was it more effects of the changes inside herself?

She forced herself to stifle her fear and revulsion, to keep walking. It was a deception. She was nearly at Brother Fist's side. All would be made right once more.

But seeing Brother Fist did not bring her the comfort she so deeply craved.

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The time apart, her weakness, something was making her look at him as if for the very first time.

He was dressed in his black cassock, and in his usual place; the big thronelike chair before the wall of screens that let him see into every corner of Ananke. But instead of stern and strong and righteous, he looked old and tired and . . .

Sick.

She tried to smother that blasphemous thought even as it was being born. It was just the Hand of God heavy upon him, a failure in her perceptions, a betrayal by her senses. The other was impossible. Unthinkable.

She bowed her head, ashamed that she had been prey to such blasphemous thoughts in his presence. "Brother Fist," she said, speaking his name like a talisman that would give her strength.

"My angel," he replied in a thick rasp. "You have done well."

Scylla hunched her shoulders. That praise heaped on the burden of her manifest unworthiness was a greater burden than even the shining armor that proved she was an angel could bear. Her heart stuttering with fear, she steeled herself to confess.

But before she could speak, Brother Fist said something that drove all thoughts of confession from her troubled mind.

"Leave us now, Scylla."

Her head snapped up in surprise. She stared at him, deeply hurt and unable to believe he could dismiss her so offhandedly. She had been away ten long days, and put her very soul in peril to serve him, yet he hardly seemed to care. His eyes were fixed on Marchey, and had she been forced to describe the look on his face she would have said that it was one of greedy expectation.

"But—but this man is *dangerous*, master!" she protested lamely. Suddenly a sickening thought came to her: *I have fallen so low that I am no longer worthy of his love.*

Brother Fist's eyes had begun turning a sickly yellow some three years before; another sign that God's Hand was on him, he said. Those sallow eyes blazed with petulant fury now. A fury directed at her.

"I said *leave us!*" His skull-like face hardened, and he beat on the arm of his chair with a bony, blue-veined fist. "Get out, you stupid bitch! *Out!*"

Scylla turned and fled, choking back a bewildered sob. She stiff-armed the door out of her way and ran across the chapel to her own room. Once inside she flung herself down on her bed.

But angels do not cry. Ever.

Biting back some hot wet force boiling inside her and threatening to burst free, she made herself sit up. She held out one hand. Sculptured silver metal covered her palms and fingers, but the needle-scarred back of it was exposed. Like her weakness. She extruded the claws in her other hand, the gleaming white ceramyl talons as sharp as the line between sin and obedience.

Sharp enough to slice into the tattooed flesh at the back of her hand like corruption had slipped into her soul. Blood welled up around the barbs, the price God demanded when he was failed. Her one green eye slid shut to hold in the wetness gathering there. The blood was born in pain, and that was good, for pain was the ladder one climbed to return to grace.

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The pain cleansed her, washing away the hurt and confusion, leaving only her essential suffering self, naked to God's judgmental scrutiny.

I am an angel. She gritted her teeth. Her talons dug deeper.

I was brought down to serve Brother Fist. To carry out his will and protect him. I am his to be used as he will. I am my duty. I must serve with no expectation of reward in this life. There is nothing of me or mine more important than that duty. If he asks my life I should rejoice that I can pay the price he asks of me. If I allow him to be hurt God himself will condemn me to eternal damnation.

Her one human eye opened, saw her path clearly.

She was Brother Fist's angel, his protector. Marchey was unpredictable, maybe even dangerous. He was alone with her master, and she, in her weakness, was leaving him undefended. He had not ordered her to listen in, but then again he had not ordered her *not* to, and how else could God's will be done?

Her claws retracted, the china-white ceramyl smeared with the red of her own blood. She stood, flexing her wounded hand. Her angel body could block the pain, but she kept it from doing so. Pain kept the doubt and deception at bay. Pain was truth, pain was clarity of thought and action.

It felt good to be back in control once more. She sat on the end of her bed, touched a stud on her comm to activate her Ear, and regained her proper place at Brother Fist's side once more.

The door closed behind Scylla. Brother Fist touched a key on his chair arm, locking it. "Come, sit down, Dr. Marchey," he said, beckoning him closer. "I've waited a long time to meet you."

Marchey looked around, choosing the seat furthest from the wasted figure in the oversized chair. He forced himself to take a long hard look at the man who'd had him kidnapped.

Brother Fist was a goblin; a fleshless skeleton draped with loose, saffron skin and infused with some sort of awful unlife. His black cassock hung on him like a shroud. His cheeks were gaunt and sunken, his mouth a black-gummed, liverish slash. His eyes were jaundiced, feverishly bright, and were fixed on Marchey with a greedy, crazed intensity.

But that was not what sent flight-response adrenaline racing through Marchey's system, turning his heart into a clenched fist and making his skin prickle with cold sweat. The primitive human animal in him recognized something the physician in him would identify with meaningless labels like *psychopath, egopath* or *sociopath*. Such creatures are hard to identify when they wish to hide like rapacious, fatally poisonous chameleons among us. But when social pretense is discarded and one of them lets its true colors—and its endless, conscienceless, fanged hunger—show, there is no mistaking that it is only nominally human.

Brother Fist read this realization on Marchey's face. He laughed, a rasping, hacking, mirthless sound that made Marchey shudder with revulsion. "Do I frighten you, Doctor?" he asked, carious yellow eyes bright and cunning.

Marchey bit down on his first reply. *Shitless.*

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"Aren't you trying to?" he asked in as close to a normal voice as he could muster.

Brother Fist's smile reminded Marchey of the gleeful, grinning rictus worn by skeletal, scythe-wielding Plague in medieval art.

"I just want you to know who you are dealing with, and that you are in a place made in my image." He gestured as if to take in all of Ananke. "This place is a crucible, my dear doctor. I am at its center—I *am* its center. I am its maker and its master. The crucible is a place where the smelter forges useless ore, reducing excess and impurity, creating something which will serve his ends. In my crucible all that does not serve my purposes is burned away. Individuality is cauterized. Love is cremated. Trust is boiled off. Hope chars into the blackest ash. . . . "

Marchey watched those awful eyes glaze as he intoned his lunatic litany in a rustling monotone that folded around him like cold leather wings.

" . . . the skill lies in heating the crucible to the proper degree, razing the human psyche until only fear and faith remain and are annealed into one. Fear and faith guarantee perfect, unquestioning service, and from the crucible comes something that can be beaten into the perfect tool. . . . "

Brother Fist's gaze turned outward once more, fixed on Marchey. He felt it bite into him, sharp and unclean as a carrion-eater's fang, and filled with a paralyzing poison. That black-slash mouth twisted into a terrible smile. "What do you think of my crucible, Doctor?"

Marchey licked his swollen lips. The man's virulent madness seemed to infect the very air he breathed like some potent mutated biowar contageon; suffocating him, shrivelling his wits and will. He shifted in his chair uneasily, but could not look away. Hardly realizing what he was doing, he reached up to touch the silver metal pin on his chest as if to find some reminder of his own identity. It was still there, dangling on a blood-stained strip of his slashed tunic.

It was almost as if a circuit closed inside him. The sense of who and what he was flowed through him again. With it came the memory of a one-eyed child this man had condemned to death out of a cynical contempt for human life. Out of cold, raw cruelty.

"I think it sucks," he heard himself say from an echoing distance that vanished in one thunderclap instant. He sat straighter, returning anger making him clamp his hands on the arms of his chair. "I think someone ought to jam some of what you've been dishing out right back down your fucking throat."

Brother Fist lolled back, eyes hooded and smirking. "But not *you* eh, Doctor? You won't raise a hand against me. Your righteous indignation is a joke. You're supposed to preserve life, not take it, to heal rather than hurt. You're bound by an oath that has mocked you for years, that mocks you even as I do."

Marchey said nothing, recalling the words he held as the one holy thing in his life. The Healer's Oath. Based on the Hippocratic Oath but further reaching, an ethical ideal he had upheld through thick and thin, and that had held him up as well.

"I'm sick, my dear doctor," Brother Fist continued, wearing a sardonic smile.

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"Probably dying. That is why I had you brought here. If I can be cured, then you will cure me."

"I won't." Marachey forced the words out, but they were no more than a hollow whisper.

Brother Fist's mocking laughter made Marchey feel like there were worms slithering through his insides. "Oh but you will!" he crowed, still laughing. "You *have* to! Keeping your ridiculous Healer's Oath is the fingertip that keeps you from falling into the pit. It is the only shred of self-respect you have left. I have studied you and your kind. Fail your oath and you will have given up everything you hold dear for *nothing!*"

Marchey could only shake his head from side to side like a punch-drunk fighter, trying to deny the steel-walled box closing around him.

"Welcome to my crucible, Doctor." Brother Fist spread his shaking hands. "You think it is hot, but you have so much left to learn. After all, how much heat can there be if your scruples are not yet burned away?" He smiled, closing his hands as if he held Marchey's life and fate in them. "Yet."

His hands fall to his lap. "You may begin examining me."

Marchey stood up, feeling sick and doomed. "But you don't believe in medicine," he protested in a pathetic attempt to escape the nightmare swallowing him up.

Brother Fist's laughter rasped across his nerves like an antique bone-saw. "Don't pretend to such naïveté. I know you are smarter than that. I simply don't believe in letting the sheep have it. It pleases me to hear their futile prayers, to see them abasing themselves because their faith isn't perfect enough to make them whole again. That is one of the brightest, sweetest-smelling blossoms in my little garden of pain."

Garden of pain, Marchey thought with numb horror as he started toward his new patient. *And I'm supposed to give the gardener the health to continue tending his bitter crops.*

Scylla hunched like a cast-silver gargoyle at the end of her bed. Head down. Shoulders sharp with tension.

Brother Fist had—

Her talons were out, and she shredded the foam bedding without even knowing it.

He had—

His own voice, his own damning words, his contemptuous laughter as he turned her service to himself and God into acts of willful cruelty, turned Revealed Truth into proof that he had—

—lied to her . . .

This was no weakness. No deception sent to test her faith.

The orderly walls of her world were shuddering and cracking, their foundation turned to a quicksand of lies, and in the chaos almost-memories surfaced like raw earth thrust up through split and buckling pavement, and if she heard any more she would—

She reached out to turn the Ear off. Her silver hand hung there in front of the key that would bring silence and safety.

Hung there. Between truth and silence. As if reaching for a lifeline. Hung there.

Then fell.

Almost as if that were some sort of

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signal; Marchey's voice came to her, breaking the aching silence.

Marchey had reviewed his options. It hadn't taken long. They were few, and equally grim. His only choice was in the mode of self-destruction.

Brother Fist had him trapped in a maze where every turning led into darkness. He couldn't break his oath without breaking himself. Brother Fist has seen that with the cynical clarity of a world view uncolored by honor, ethics or scruples. But if he kept his oath and healed this monster so that he could continue his reign of terror, the rape of his skills would probably have the same terrible effect on him as breaking his oath. Being a Bergmann Surgeon was his whole existence; outside that his life was empty and meaningless. If he lost it, he would end up taking Ivan's way out and dying by his own hand.

He could not kill Brother Fist, nor could he let him die if it was in his power to heal him. Those might in one sense be the "right" things to do, but not for him. He had long ago sworn to accept the precept that every life was sacred. His whole life had been dedicated to saving lives, not taking them. He could not abandon that principle now, now when it was being tested.

There seemed to be only one way out of the maze, out of the crucible. That was to survive, and to try to escape Ananke with enough information to bring Brother Fist's rotten empire down around him. To do that he had to heal him. To surrender. To let himself be broken, and hope he was cast away.

He took a deep breath. "Let's take a look at you," he said heavily. The heart-sick resignation in his voice was no ploy. He started toward his new patient.

Willingly walking deeper into the crucible.

•

Brother Fist produced a gun from a hidden pouch in the arm of his chair, pointed it at Marchey's chest.

Marchey stopped, eyes on the weapon. He knew just enough about arms to recognize the big, blued-steel pistol as an old-style Fukura 'Spring Flower' automatic. The folded steel projectile if fired would make a fingerprint-sized hole going in. And exit through one the size of a filled dinner plate.

Brother Fist hacked gleefully. "Think of it as Malpractice Insurance." He gestured with the gun. "Come on, get to it."

Marchey obeyed, eyes still on the weapon. "You don't have much trust in your fellow man for a priest."

"Please, doctor. I'm no priest, and you know it. But you're an intelligent man. You must wonder what I am, and how I got here. I wasn't always Brother Fist, you know."

"No?" Marchey said tonelessly, "What a surprise. Give me your wrist."

The old man offered his free hand, a bundle of sticks covered with wrinkled yellow parchment. Marchey took it. It was cold and dry, like the skin of a snake. A silent command started the devices inside his silver metal hands recording pulse, blood pressure, blood-fraction, GSR and a dozen other tests. Data whispered through his mind; the first bare threads in the warp of diagnosis.

Brother Fist settled back, but kept his

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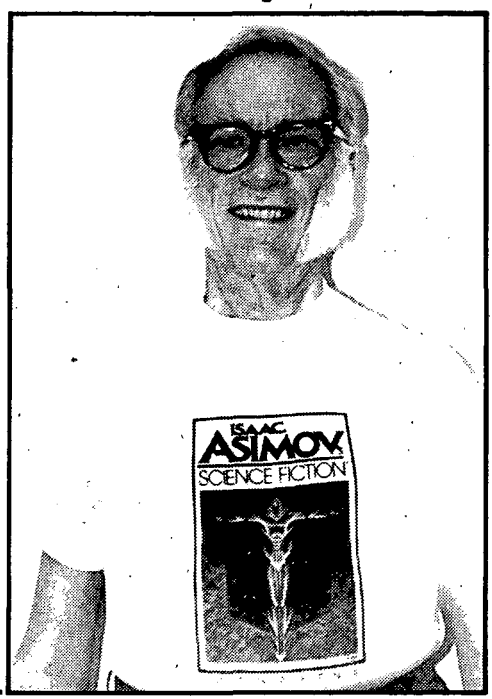

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weapon centered on Marchey's breastbone. "I came here about ten years ago. Back then Ananke was about half wildcatters. The other half were members of a religious group calling themselves the Immanuel Kindred. It looked like the perfect place to settle down, practice my speciality and make my fortune."

Marchey pressed a yellowed nail. No color change. "What speciality is that? Phlebotomy?"

A sardonic chuckle. "It's most often called PhageWar. It is a lovely combination of the best elements of psychological warfare, guerilla warfare, covert action, guided subversion, sabotage, terrorism, propaganda, and brainwashing. It is war fought without an army, prosecuted from the inside, and modelled on the techniques of that splendidly successful, highly adapatable; and wholly admirable creature, the virus. I was one of the top theorists and architects. You would find my real name turning up quite often in certain *sub rosa* literatures.

"But I grew tired of working for governments and MuNats. They were the ones reaping what I sowed, and even what you would call the worst of them have these archaic compunctions which kept me from exercising the full flower of my genius. I came here looking for a place to more freely exercise my arts. No longer having to share what I took was but icing on the cake of seeing my visions implemented in their purest form."

Marchey began scanning the old man's extremites. Brother Fist's sick pride in his work and what he was finding put a grim frown on his face.

"Anyway, the Immanuel Kindred showed me the light, so to speak. They believed that man was made in God's Image, and so remaking space in man's image served God. They were friendly, open-minded, tolerant, and most importantly, industrious. They worked twice as hard as the wildcatters, believing they served a greater goal. So many systems fail for lack of initiative. Their religious system offered me possibilities far beyond what I could get from simply co-opting the politics of this place."

"So you took over the Immanuel Kindred," Marchey said, to prove that he was still listening. This was nothing he wanted to hear, but the more he knew the better his chances were.

Brother Fist showed him a smug, sharkish smile. "I ate them *alive*. Then I began turning them into something useful while I finished bringing the wildcatters to their knees."

Marchey began scanning Brother Fist's sunken chest. "You did this all by yourself?"

"I was a wolf among sheep. Oh, I had a mercenary to do the wet work, a Shock-trooper who'd gone renegade."

Marchey looked up, confused. "Scylla?"

The old man's chuckle made the hair at the back of Marchey's neck stir uneasily. "My angel? Isn't she a lovely thing? But no, this man was an expendable who finally had to be expended—though you could say that the best part of him lives on."

"Scylla's exo." Marchey stepped back. The woman inside that dead man's exo didn't even know it was machinery. His gut-feeling that she was just another victim had been on the money.

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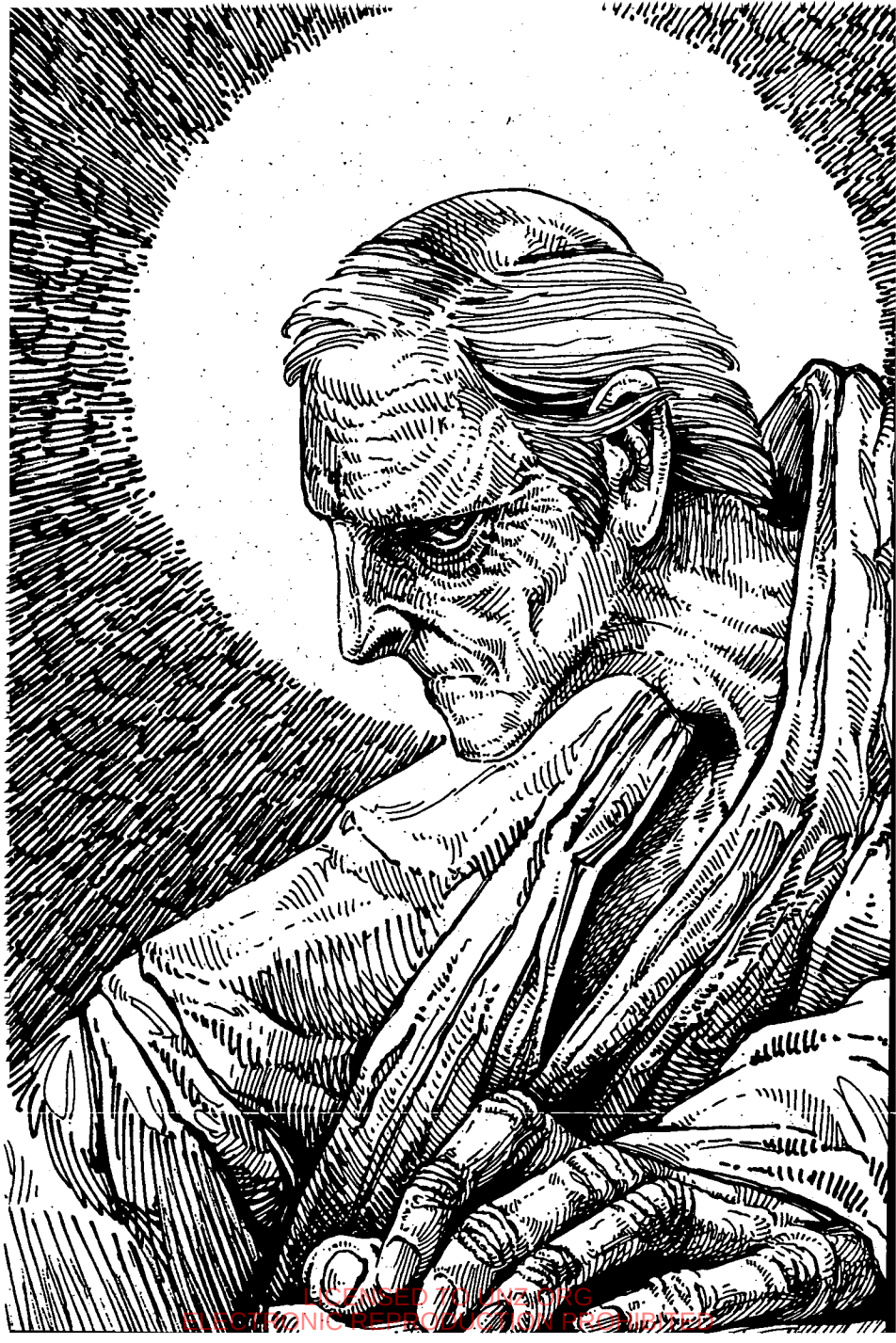
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"Exactly. Why are you stopping?"

Time to bite the bullet. "I've found out all I can externally. Now I have to go inside." He already had a good idea what he would find.

Those yellow eyes brightened. "Ah, now you do the thing that has made your kind pariahs among your small-minded fraternity. I can hardly wait to see you in action."

Marchey sighed. "Then we have a problem. You have to be unconscious for me to work."

"Oh yes, the sacred rituals of surgery." That skeletal face took on a crafty look. "Tell me, do you recognize the name Keri Izzak?"

"She is a Bergmann Surgeon like myself," he said, feeling cold trepidation curl through him anew.

"*Was.* The lovely Dr. Izzak no longer practices medicine. Or breathing, for that matter. About a year ago I had her kidnapped off Luna and taken to Earth. There she was subjected to some tests of my own devising. It cost me a pretty penny, but it was money well spent. She allowed me to prove a theory of mine."

The cold was all through him now. *Keri dead?*

He found his voice. "Theory?" Keri dead to prove a theory?

Brother Fist wagged a bony finger. "You mustn't forget that I am a scholar. I started getting sick about three years ago. So I began studying your specialty, since it is the most advanced form of medicine presently available. That was how I found a blind spot in the data, one so simple that it has been overlooked all these years. It looked promising enough to be worth spending some of the credit my people have so generously given me on having a Bergmann Surgeon kidnapped and tested. Ms. Izzak had the honor of being the subject of those tests."

He cocked his head. "Tell me, Doctor, what happens after one of your patients wakes up?"

"They remember," Marchey answered tonelessly. "They remember me inside them. They have nightmares about me. Any patient that sees me afterward becomes acutely hysterical. In the beginning we had several patients nearly die of fright. One actually did."

Brother Fist smiled. "Not the basis of a very good doctor-patient relationship, is it? Too bad you're not equipped to properly savor fear. You usually work in a deep trance. Is that necessary?"

Marchey shrugged. "Maybe not. When you first start you need it to keep your limb image. It guarantees total concentration. I guess I keep doing it that way to help me concentrate, and because it helps shut out the reactions of the other medical people who are there while I work. But I don't see—"

"Of course you don't," Brother Fist replied archly. "No one did until *I* came along. It's really quite a wonderful thing, the way your life has been made so needlessly miserable. The irony is even sweeter because you'll never get to try it out on anyone but me."

Marchey didn't miss the implication that he would never leave Ananke alive. But all he could think about was *What had they missed?* He thought over the hints he'd been given.

"You're saying . . . if I work in just a light trance . . . "

An encouraging nod. "And?"

"And . . . " He racked his brain, his

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thoughts going in circles until they tripped over the obvious. But it was *too* obvious—wasn't it? He said it out loud only because nothing else came to him. "And the patient is conscious . . . "

"Bravo, doctor! You have it! Your tightly focused concentration leaves a psychic scar on a mind made especially impressionable by unconsciousness."

Marchey sagged inside. It couldn't be that simple. It just couldn't! That was as simple and obvious as antiseptic procedure, as manual CPR or the Heimlich Maneuver—

—the oldest of which had been in use just over 200 years, the other two were even newer than that; relatively recent innovations in the long history of medicine. It made perfect sense, and its very simplicity is what made it so elusive.

He felt his pulse quicken. If this was true . . . then what would change? The fear and envy and mistrust of other medical people would probably remain. He would still be regarded as a strange and probably dangerous lunatic who had willingly mutilated himself to become some sort of witch-doctor. That opinion was too deeply entrenched to be changed quickly, if at all.

But he would no longer be forced to work on a succession of faceless, senseless, unplugged meat machines that would remember him afterward in their nightmares. He would be able to look a patient in the face after his work was done. He would be able to see them smile, see tangible proof that the price he'd paid had been worth it after all.

That would make all the difference in the world.

"Are you ready to begin, Doctor?" Brother Fist purred, wrenching Marchey back to the here and now. "You want to know if this will work or not, don't you." It was not a question.

Marchey's shining hands closed into fists. *Yes, he had to know.*

The walls of the crucible were steep and high. The creature that called himself Brother Fist had known all along that Marchey would treat him, if not for the sake of his oath, then to know if his heart's deepest desire was truly within his grasp. Just as he knew that he was turning the gift into garbage—if you could call something purchased with another's death a gift—even as he gave it, for there was no way for Marchey to heal him and ever feel clean again.

Brother Fist had turned him into a rat in a choiceless maze that had narrowed at every turning. Now he was so deeply into it that he thought he could at last clearly see the path ahead. There would be no escape short of death. But his captor would probably keep him alive to be his personal physician, and to torment by forbidding him to treat any of the people who needed and deserved healing. That would be entirely in character.

Marchey pitied the people of Ananke now more than ever. They hadn't stood a chance against this brilliant, malignant Midas whose very touch spread corruption and ruin. Ananke had been turned into a monstrosity, just like Circe had turned Scylla—

Scylla. The fair maiden turned into a monster.

But what had she been before Brother Fist laid hands on her? Could there be a potential ally under that horrific mask? It was only a straw of possibility, but there was nothing else within his grasp.

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"Yes, I'm ready," he said slowly. "But old habits die hard. I want you to talk to me while I work."

"And what should I talk about?" A death's-head grin. "Would you like to hear how Dr. Izzak died?"

"Not that," Marchey answered curtly. He tried to make his voice flat, uninterested. "Tell me about Scylla."

Brother Fist settled back into his chair. "Now there's a wonderful story! In some ways she's my crowning achievement. . . ."

Scylla listened closer at the mention of her name.

The talk about trances and the rest had meant nothing to her. She had only half-listened, her mind still reeling from the new version of Brother Fist's advent on Ananke she'd heard before it began.

But . . . could it possibly be true? If her master could lie, then how could she know the truth when she heard it?

Was *she* a lie? Living a lie?

She *knew* that Brother Fist was chosen by God to lead them all up from their fallen state into perfect faith and righteousness. She was his angel. She had only to look into a mirror to see proof of what she was. Her very form was gilded with Heaven's power to make her a living instrument of obedience. Her strength was an angel's might. She had been brought down to protect God's Chosen One, to chastize the faithless and punish the sinful.

But—

Why did his story have this resonating ring of truth? Why had it set off what seemed to be rememberances of countless things she had never seen; faces, feelings, moments from a life she'd never lived?

Why did she keep coming back to the hazy memory of a voice that might have been her own screaming, a woman's face filled with despair as she was taken away, that face again, crying, pleading, begging her not to—

The fragmented memory ended there, like a high, crumbling cliff over the edge of deepest, darkest horror.

Brother Fist began to talk.

His angel hung on his every word, seeking and dreading revelation.

"I had Ananke pretty well in the palm of my hand. I knew I needed an enforcer to mop up and keep things from falling apart. But my mercenary already had too much power for his own good or mine, and he was beginning to get ideas. So I—"

Brother Fist paused to watch Marchey.

Marchey ignored him. He stood before a high table, sleeves pushed back to his biceps, his gleaming prosthetics crossed before his chest. He began to breathe deeply, eyes closed, effortlessly sliding into that old familiar *pranayama*. His silver hands fluttered like mechanical birds in rhythm with his breathing. The grim expression darkening his face faded as he centered himself. But instead of letting himself sink into that deepest state in which he always worked, he kept himself at what felt like a usable higher level.

His eyes opened. There was a nagging urge to slide deeper, down to where habit told him he should go. He wiped it away with a mental twist, then bent at the waist, resting his arms on the ta-

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ble, palms up, the clockwork birds of his hands still and sleeping. Reclosing his eyes, he took a deep breath and *let go*.

He breathed a sigh of what might have been pleasure as he straightened up and stepped back. His metal prosthetics remained on the table, inert and lifeless. His arms ended just below the elbow joints in featureless silver plates.

He felt relaxed, oddly detached. In deep trance he had always felt like the beam of a laser-scalpel; a straight hot true line of will so concentrated and tightly focused that neither emotion or personality could fit into that narrow bandwidth.

This was like being in a dream. He knew that if he came out of it having healed Brother Fist, the one pure thing in his life would be ruined forever. But for the moment, he was at peace. He turned toward his patient to be, a bemused expression on his face.

"Talk, old man." Talking in trance was a new thing. His voice came out as a raspy whisper.

Brother Fist blinked and stared at Marchey uncertainly, then recovered his nerve by tightening his grip on the gun. He kept it trained on Marchey's belly as he approached, a slight tremor betraying his apprehension.

"Where was I?" he said, still flustered. "Oh yes, I needed someone I could trust. One of the people who fought me the hardest was a Kindred named Anya. She had a daughter named Angel. I took Angel hostage, and that took the fight out of Anya. But Angel's name made me think. I had set myself up as the chosen of God. I needed an enforcer I could trust, and what would be more fitting than a Guardian Angel?"

Marchey hovered over Brother Fist now, the stumps of his arms poised as if he was going to touch the old man's chest. But he had no hands. He moved closer yet, the silver plates at the end of his truncated arms stopping just inches away from Brother Fist's chest. The cruel master of Ananke licked his lips and swallowed hard, his yellow eyes grown large with apprehension.

He knew that Marchey was reaching *inside* him.

The abandoned silver limbs were nothing, even though they had come to symbolize his misunderstood speciality. Many amputees who for one reason or another could not have replacement limbs grafted on wore similar prosthetics. They were tools, and their built-in diagnostic circuits only made them more useful tools. They replaced his amputated hands and arms so he could do the everyday, ordinary things.

Bergmann Surgery was no ordinary thing. It called for a completely different sort of hands. It had its beginnings in a phenomenon occasionally experienced by some amputees called the phantom limb syndrome; a feeling that the missing limb is still there, and sending sensory information. A man named Dr. Saul Bergmann studied this phenomenon, and created something strange and wonderful from it.

A Bergmann Surgeon was someone who had after exhaustive—but still inconclusive—testing gambled his or her hands on the chance that he or she would have the innate and trainable ability to use that limb image to reach inside a patient's body to perform feats that were

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miraculous by the standards of normal surgery.

A surgeon's hands are everything. Voluntarily having them amputated was one of the beginnings of the estrangement between the Bergmann Surgeons and the rest of the medical establishment. What they could do, their almost inhuman demeanor while they were working in deep trance, and the reactions of their patients only served to widen the rift.

Brother Fist squirmed slightly, unnerved by the knowledge that Marchey could be holding his beating heart in his immaterial hands, and only the oath he had mocked kept the man from turning it to dead meat in his chest. He felt no pain. If he felt anything at all, it was like the lightest of caresses. The old man returned to his telling of Scylla's genesis to keep his mind off what was happening inside him.

"I wanted a Guardian Angel, so I turned Angel into *my* angel. I tore her mind down and rebuilt it to my specifications. There was a doctor here, and I made him imp the eye that lets me see what she sees, redo her teeth, and install her in my mercenary's exo since he didn't need it any more." He chuckled darkly. "Someone gassed him in his sleep. The artwork on her face is mine, just like she is mine."

Marchey changed position, his unseen hands tracing the convoluted skeinings of his patient's nervous and circulatory system upward into his head. He wore a tight-lipped, disapproving frown. Form V cancer had turned the old man's thoracic area into a nightmarish, metastatic jungle of black-flowing malignancies.

"I turned her into the perfect enforcer and bodyguard. She doesn't believe she is an angel, she *knows* she is one. Every glance into a mirror confirms that certainty. Her loyalty is absolute, and she will disbelieve her own senses before she doubts me or my orders. I named her Scylla, a joke only I was equipped to appreciate. When she was ready, I tested her. Her first two tasks were to kill the doctor who made her what she was and, of course, her own mother."

Marchey shook his head, displeased. Form V sometimes manifested itself as vascular cancer, insinuating itself into the very cells of the vein and capillary walls. That was what it had done here. The structure of Brother Fist's brain was as rotten and tumorous as the abomination of a mind it housed. As he explored the damage some separate mental subsystem heard how a girl had been warped into a monster and felt sorrow, and another felt relief that there was only a remote chance that he would be able to perform a self-damning healing. But for the most part he was in the position of a fireman who has arrived on the scene only to find the house he is supposed to save already completely engulfed in flame.

Brother Fist could not resist fondling the cold bones of his works. "The look on her mother's face was one of the most beautiful things I've ever seen in my whole life. She begged, but it meant nothing to my creation. Scylla tore—"

Suddenly the chamber's walls shuddered to a sound like thunder-struck steel, like shattering rock, like the first trump of the Apocalypse. Brother Fist stared past Marchey, his face turning the color of curdled milk when he saw

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Scylla standing in the open doorway. Her demonic face was knotted into a terrifying mask of blackest hatred. Her angel eye was aimed at her master like a gunsight. Her other eye burned with an angel's wrath and glistened with an angel's scalding unshed tears.

"—No," he began, his voice coming out as no more than a frightened whistle. He tried to aim his gun at her, but Marchey's body was in the way. He shoved at the larger man with feeble desperation, but all Marchey's attention was focused on the impossible task at hand.

"Fist." Scylla's voice was cold, empty; the sound of a soul scoured by vacuum. She stepped over the rubble that had once been a heavily reinforced door. "You. *Bastard.*"

She stalked toward him, her steps measured and graceful, the gleaming silver metal of her exo flowing liquidly with her every motion. She seemed to glow with gathered power and purpose; a sword-bright instrument of vengence cast in seamless argent and set into fluid, unstoppable motion. She was beautiful, the way a panther closing in for the kill is beautiful.

But Brother Fist was in no position to appreciate his creation's perfection. His panic-stricken squirming finally let him get the gun pointed at Scylla. He wasted no time on warning, pulling the trigger in a convulsion of fear. The gun bucked in his hand, wrenching itself out of his feeble grasp.

Scylla's amped reflexes let her reach out and swat the folded steel missile screaming toward her forehead aside like a lazy fly. One eye in the screenwall shattered explosively and went blind. She bared her sharkish teeth in something too terrible to be called a smile.

"I don't know if I'm really an angel any more," she said as she came up behind an oblivious Marchey, her voice throbbing with anger and hoplessness. She shoved him aside, knocking him off his feet, then reached toward her creator.

"—but I'm going to send you to Hell." Her curved ceramyl talons hissed from their sheaths and locked into place.

Brother Fist cringed deeper into his chair, but there was no way for him to escape his angel's caress.

Marchey found himself face-down on the floor with only a hazy idea as to how he had gotten there. He turned himself around in time to see Scylla wrap her taloned silver hands around Brother Fist's throat.

He shouted and flung himself at her. He tried to restrain her by wrapping his arms around her. They sank through her as if they weren't there. He stared at his stumps in dumb surprise.

Brother Fist's liverish lips formed soundless pleas, his bony fingers clawed in futile desperation at the vice clamped around his throat. Wet, livid red spattered his black cassock as the ceramyl talons sliced into his flesh. Scylla stared down at him with her head cocked to one side as if seeing him clearly for the very first time. The anger on her face was gone. All that remained was a barren, lifeless, moon-cold landscape.

"Don't do it Sc—*Angel*," Marchey crooned soothingly as he brought the invisible hands that made him what he was to bear. He moved them gently in-

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side her, playing her like a harp as he delicately probed this nerve, that artery.

"I have to." Her voice was perfectly flat. Emotionless as the metal that sheathed her tightening hands. Her shoulders sagged, but her grip did not loosen. A bluish cast colored Brother Fist's skin now. His hands scrabbled like dying crabs.

"You don't. Let him go. He's beaten now. Look at him. He's old. Sick. He's *dying*. Form V cancer, that's what he has, and it's so advanced even I can't do anything to save him. Let that kill him. Don't let him make a killer out of you."

Scylla's one eyelid was growing heavy as Marchey's touch gently stole her consciousness. "But I'm already a killer," she whispered as if confiding a secret. Her voice was like a child's now, high and breathy, each word more slurred than the last. "I killed my muh—muh—*mother!* I did! And others . . . " Tears finally spilled from her one green eye. Human tears.

"Scylla did that, Angel," Marchey insisted softly. "Angel loved her mother, would never hurt her. Sleep now, Angel, let Scylla go. Let this sick old man go."

Scylla's grip slowly relaxed. Brother Fist fell back, choking and wheezing as he tried to draw air through his bruised and bleeding throat. Scylla's arms dropped to her side and she sighed heavily.

"That's it, Angel, let it all go. Go to sleep now, go to sleep."

For Marchey the human body was an open book, and he knew every page, every line. He thought he could safely manipulate her voluntary muscles now. But it was a slow, subtle business, and he could only work them two at a time. If he'd tried before she probably would have resisted and killed him. He changed the position of his spectral hands, making that muscle contract, that one slacken, gently guiding Scylla down to the floor. Her eye was shut now, her face smoothing as sleep overtook her. He followed her down, still crooning her name, still telling her to sleep.

Angel slept, and Scylla slept with her.

Marchey knelt there beside her, staring down and trying to see the Angel face hidden behind the face of the angel. He bit his lip, then slowly ran an invisible hand across her features.

The demon mask vanished under his touch line by line, revealing the pale, unlined face of a woman in her mid-twenties. That face softened as if she somehow knew what he had done and, like a light in the darkness, a serene half-smile appeared.

Marchey felt tears in his eyes. He sat back on his haunches, thinking about the hard road Angel had ahead of her. There was a rustling sound behind him. Before he even had time to wonder what it was, Brother Fist crashed into him from above.

He threw his head back and screamed as Brother Fist drove the knife he clutched in one bony hand deep into Marchey's back. He twisted desperately, pain exploding along every nerve as the knife was wrenched out of his flesh. He reared back, bucking his attacker off before he could strike again. Operating on blind instinct, he turned, slamming his knee down on the knife arm, hearing a satisfying crack as the brittle old bones shattered.

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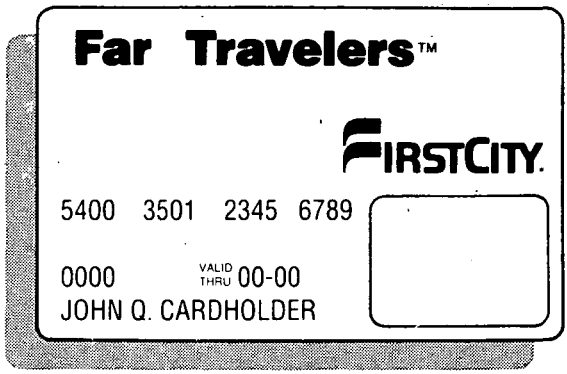
The Shape of Things to Come



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A guttural curse at his lips, he thrust one immaterial hand into Brother Fist's scrawny neck, squeezed. Those hate-filled yellow eyes bulged as if about to explode from his head. His seamed mouth gaped open in soundless, breathless agony.

Marchey felt his lips peeling back from his teeth in a feral grin. His pulse hammered in his ears as adrenaline surged through him in a red tide, washing away his reason like a sand castle under a tsunami, and leaving only the urge to expunge the life from the vile creature writhing under him, to avenge Keri Izzak and Angel and her mother and every one of the countless, faceless victims who had suffered at his hands, to—

His spectral fingers took hold of the old man's spinal cord and he braced himself to rip it out, to—

—to become a killer, now that he could be a healer again.

He let out a furious, frustrated growl. Changing his grip, he expertly and ungently snuffed out Brother Fist's consciousness.

But not his life.

Marchey sagged back, panting and twitching. After a minute he heaved himself to his feet, crying out as the pain from the wound in his back came rushing in and almost knocked him down again. Closing his eyes he recentered himself, then reached awkwardly back and closed the wound. He didn't wipe all the pain away; the residual ache would be a reminder to be more careful.

Now what? he asked himself, looking around dully. His gaze was drawn by the gleaming silver of his discarded prosthetics. That was as good a place to start as any.

He went to put them on, the better to begin picking up the pieces.

Some of the pieces had names. Needs.

He looked at Scylla. No, he reminded himself, *Angel*. She would need a lot of help to overcome the terrible damage that had been done to her. The simple, straightforward task of releasing her from the prison of that exo would only be the beginning of a long, slow, painful process. She had been a thing for ten years, and it might take that long to make her whole again. He would have to make Brother Fist tell him exactly what had been done to her so it could be reversed.

Which brought him to Brother Fist. He was pretty well neutralized for now, but he would have to be watched closely for his own safety and everyone else's. Something would have to be done with him. He supposed the best he could do was keep the old degenerate from being killed by those who had ample reason to want him dead, while trying to pry his secrets from him before he died.

The heat of the moment past, Marchey realized Brother Fist had proved his oath's precept that even the meanest human life had value by finding a way for Marchey's and his fellow Bergmann Surgeons's lives to have meaning once more.

But one part of him hoped this unwitting good work tormented the miserable son of a bitch to his dying day.

He had to get word back to Bophanza, let him know that at least part of the dream could be salvaged after all.

All Ananke was in need of healing.

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There was a one-legged man, a scarred and trembling woman, a one-eyed boy under the shadow of death—who knew how many others. But the wounds of the flesh would be simply repaired compared to the wounds of the spirit. Those would take him the longest to heal.

Him.

He finally realized that he was assuming that these tasks were his to perform. He would have to work day and night for months, perhaps years to do all that needed to be done. But he would be a whole doctor again. After such a long, long time.

He stared down at his hands, suddenly full of doubt. Two hands. A whole world of hurts. Had it been too long? Had he lost his touch? Had the years of drinking and loneliness and apathy and disconnection damned him to be a mere meat mechanic now and forever?

He reached up to touch the silver pin he still wore over his heart. Once it had been his pride and his hope, then his curse and his shame, and after that it had been the marker for a dead dream. It signified all he had become; a flaccid sack with only one bent and corroded thing at the bottom. And now . . .

Now he felt a brightening sense of pride that he had held onto the dream through the long, bitter years. Of hope resurrected from despair in the unlikeliest of places. That pride and hope gleamed inside him like something that has come from the crucible purified and annealed.

Marchey shook himself from his reverie. There was a world of work to be done, a world of need waiting for him. This was no time for dreaming, it was time to put the dream into action.

He rubbed his silver metal hands together and smiled, eager to begin. ■

EDITOR'S NOTE: This story is a sequel to "A Touch Beyond," which appeared in our January 1985 issue.

●A man should never be ashamed to own he has been in the wrong, which is but saying, in other words, that he is wiser today than he was yesterday.

Jonathan Swift

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January 1930

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—The Editor.
Harry Bates

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It was on or about March 10, 1944, when Counter Intelligence Corps agent Arthur E. Riley knocked on the doors of *Astounding Science Fiction*'s editor, John Woods Campbell, Jr., and demanded to know what the hell was going on. The March 1944 issue of *Astounding* had just hit the stands with the story, "Deadline," by Cleve Cartmill. Although set on an ostensibly alien planet, involving an ostensibly alien war, the story had contained some rather disquieting lines. To wit:

"They get it [U-235] out of uranium ores by new atomic isotope separation methods; they now have quantities measured in pounds . . . They could end the war overnight with controlled U-235 bombs. . . . So far they haven't worked out any way to control the explosion . . ."

That was a bit too close to the mark. Only a few people in the country were supposed to know about isotope separation and the atomic bomb effort, and Military Intelligence could figure out no way that a pulp magazine could learn of it except through a security leak.[1] Curiously, one of the CIC's main concerns was that the information contained in the story would leak *into* the Manhattan Project, since only a few people there had the Big Picture.

Finally, everyone admitted that the "leak" was knowledge available to "anyone with a smattering of science and a fertile imagination." Although one security officer suggested revoking *Astounding*'s postal privileges —tantamount to shutting the magazine down—cooler heads prevailed and the incident was soon forgotten, except in the folklore of science fiction.[2]

Who knows what might have happened had the CIC read "Solution Unsatisfactory," by "Anson MacDonald" (a.k.a. Robert Heinlein)! In the May 1941 issue of *Astounding*, Heinlein had described not only a great project to beat the Germans to a nuclear weapon, but also a post-war nuclear stalemate between the US and Russia.[3]

Astounding/Analog has always had a reputation for hard science fiction and serious speculation. Harry Bates set that tone with his editorial in the premier issue of *Astounding Stories of Super Science*. It seems appropriate that on this Sixtieth Anniversary of that premier issue, we ask how well his promise has been kept. To what extent have the stories and fact articles in these pages given us a window on the future? Dr. Schmidt has asked me to write a brief article on this subject.

Why me? Well, everyone else ducked. . . .

I first met *Analog* on my way home from high school in the winter of 1963, when I wandered into the newsstand at the old Northampton Street National Bank in Easton, PA. The January 1964

[1]Hence the distinction between military intelligence and intelligence as we know it.

[2]For a full treatment of *l'affaire* Cartmill, see Albert I. Berger's "The Astounding Investigation," *Analog* (Sept. 1984).

[3]To be fair, the weapon he envisioned was a radioactive dust.

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issue, an impressive 8½ × 11, caught my eye. Now, my library card had lost its virginity to SF, but this was something new. Shortly afterward I started my subscription. Since then I have missed only a few issues, through accident or interstate transportation; but those have been replaced. So this is not only the Year of Jubilee for *Astounding/Analog* but also the Silver Anniversary of my subscription.

To prepare this article I spent several days browsing through my *Analog* collection. I also spent a day at the editorial office, looking at brittle, old issues. (That wasn't easy. Davis Publications was playing "musical offices" that day, so I had to dig through packed cartons and fight off Gardner Dozois's intermittent efforts to unload L. Ron Hubbard decalogies on me.) Reading those old stories, I found it all too easy to zip past things that are familiar here-and-now, forgetting that they were yet-to-come when the stories were written. Many of the technological and social "forecasts" that appeared in *Astounding* during the '30s, '40s, and '50s are things that we already take for granted. Superhighways? Of course. Weather satellites? Haven't they *always* been there? And what's so amazing about live TV transmissions from China? Even harder to spot were things that are already obsolete.

"Tanks" by "Murray Leinster" appeared in the very first issue of *Astounding*.[4] "Tanks" described a future "War of 1932" fought almost entirely with tanks and aircraft (although it was two lowly infantrymen who saved the day). *Blitzkrieg* was not yet a part of our vocabulary in January 1930; but today the story has an old-fashioned feel to it. It doesn't *sound* like SF any more. To gain perspective on this problem, read "Eric G. Iverson's" charming tale, "Hindsight" (Mid-Dec. 1984), and see how much has changed just since the 1950s.

So I had to browse very carefully through all those *Analog*s. It was a dirty job, but someone had to do it. The trouble was that I couldn't browse. I started to *read* the *%$ things.

Well, I suppose there are worse ways to kill an afternoon.

What follows, then, in no particular order, are the results of my ramblings.

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[4]The First Cover, for the story "The Beetle Horde," featured a man fighting a gigantic beetle. They just don't make 'em like they used to, do they?

That Buck Rogers Stuff

"We were searching .... for a way to use U235 in a controlled explosion. We had a vision of a . . . single explosion that would flatten out an entire industrial center . . . If we could devise a really practical rocket fuel at the same time, one capable of driving a war rocket at a thousand miles an hour, or more . . ."

"Anson MacDonald" in "Solution Unsatisfactory," May 1941

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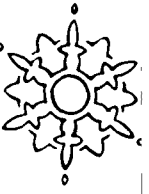

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"In my opinion such a thing is impossible for many years. . . . [P]eople . . . have been talking about a 3,000 mile high-angle rocket shot from one continent to another, carrying an atomic bomb and so directed as to be a precise weapon . . . I think we can leave that out of our thinking."

Dr. Vannevar Bush,
Testimony to Senate committee, 1945

I read about many *Astounding* things over the years. Not just space ships and Moon landings and aliens and galactic empires. But little plastic cards that you could stick into a slot and make purchases. And ecological balance and carbon dioxide building up in the atmosphere. And criminals stealing money by reprogramming computers. And superconductivity and cold fusion. And split brains and alpha wave conditioning. Weather satellites. Robots. Liberated women. Hovercraft. Training simulators and home computers. Primate intelligence. An Israeli atomic bomb. The end of the Cold War. Computer art. Often I read about these same things in the ad-mass media—but not until years later.

Why is it that SF seems to have a better line on the future than so many of the experts and mainstreamers? Why is everyone else so surprised (and even angry!) when Tomorrow turns out to be different? To some folks, science fiction is synonymous with prediction, and science fiction writers seem to have crystal balls.

Well, they're not crystal.

In *Waldo* (Aug. 1942), Robert Heinlein described manipulator arms remotely controlled via television screens. These devices later came into widespread use, first to handle radioactive materials, later for other sorts of work (such as microsurgery); and—guess what?—they were called waldoes![5] Gee Whiz! Talk about prescience . . .

Sorry, friends, but Heinlein himself saw it differently. Way back in 1918, he had read about a man suffering from myasthenia gravis who had developed complex levers to enable him to use his meager strength. Heinlein, when he wrote *Waldo*, was a mechanical engineer with a solid background in linkages. Television had already been invented (some twenty years before the public heard about it). So . . . Attach the TV camera to the linkages and—presto!—instant waldoes. "As prophesies," he wrote, "these fictional predictions of mine were about as startling as for a man to look out a train window, see that another train is coming head on toward his own on the same track—and predict a train wreck."[6]

[5]See "Waldo Goes to Work" in the November 1964 issue.

[6]Heinlein, Robert A. "Science Fiction: Its Nature, Faults and Virtues," in *The Science Fiction Novel*, (Advent, 1959) We might also mention that scientists and inventors read a lot of SF. The story itself often inspires the invention. Heinlein told a friend about a gadget he dreamed up for a story. The friend had the gadget in breadboard before the second installment hit the stands; and in widespread Naval use before the end of the war.

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I learned that lesson in my Very First *Analog* (Jan. 1964). In John Brunner's story "See What I Mean!", international arms control negotiations were bottlenecked because some delegates thought in abstractions while others thought in pictures. Not long afterward, I read a tiny news item describing neurological research that exactly paralleled the story; so I wrote a letter to John Campbell marvelling over Mr. Brunner's prescience. Campbell's reply pointed out that the author had probably based his story on that research. That was when I learned that PREDICTING THE FUTURE was mainly a matter of PAYING ATTENTION TO THE PRESENT.

SF writers read the technical literature. Many of them are scientists themselves or associate closely with scientists (cf. Jay Klein's Biologs). Dr. Schmidt is a physicist; Dr. Asimov, a biochemist. *Analog* authors include engineers, anthropologists, economists, medical technicians, and science writers. Is it surprising, as Heinlein once asked of SF writers in general, that they manage to be right rather often?

Crystal balls? They're not crystal. They're made of aqueous and vitreous humors. . . . But you have to keep them open.[7]

"[Lee] De Forest has said in many newspapers and over his signature that it would be possible to transmit the human voice across the Atlantic before many years. Based on these absurd and deliberately misleading statements, the misguided public . . . has been persuaded to buy stock in his company."

U.S. District Attorney, at the mail fraud trial of Lee De Forest, "Father of Radio," 1913

"While theoretically and technically television may be feasible, commercially and financially I consider it an impossibility, a development of which we need waste little time dreaming."

Lee De Forest, "Father of the Radio," 1926

(Lee, ya shoulda known *better!)*

When we think about the sheer number of SF stories published annually, it would truly be Astounding if *none* of 'em "came true." What makes SF seem more predictive is its willingness to speculate. The experts *have* to be cautious. Their reputations are at stake. SF writers have no reputations. Or rather, their reputations are for being far-out. Yet, even daring predictions are often not daring enough.

Dr. Asimov set his "psychohistory" thousands of years in the future ("Foundation" [May 1942]). Yet the founda-

[7]Why? What kind of balls did you think I meant?

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tions[8] of a rigorous social science are being laid down right now (cf. "An Introduction to Psychohistory," [Apr/May 1988]). Dr. Schmidt recalls that "in 1968 researchers in holography believed that real time holographic television transmission might be feasible in 100 years, if ever. So, I deliberately set 'A Flash of Darkness' (Sept. 1968) a mere 30 years in the future, expecting all kinds of flack. In *five* years, the equipment was available. It cost $30,000, but that was expected to drop."

In fact, sometimes you have to run pretty fast just to stay out front. I once wrote a story in which DNA genotyping was used by police to identify suspects. Now that just seemed like a reasonable thing to me. I mean, how else *would* they do it? But between the time I sent that story off and the time it appeared, the news broke of a Florida rape case in which the suspect was identified and convicted based on his DNA "fingerprint." Since then there have been a score of such cases.[9]

Mainstreamers are even worse than the experts when it comes to the future. At least the experts know that there is a future. But mainstream writers seem convinced, as Dr. Asimov puts it, that *things will always be the way they are now*. They are willing to admit, grudgingly, that water flows downhill; but adamantly refuse to admit that it might hit bottom. "If there is oil in the ground today, there will be oil in the ground tomorrow." The Good Doctor began to worry about resource depletion after reading an SF story about it in 1933. Others, he writes, waited for the day that long lines formed at the gas station before deciding that some day there might be long lines at gas stations.[10]

Well, that's escape literature for you.

I recently read an article on writing in the *New York Times. Book Review*, the "fanzine of the lit–fi genre."[11] The (mainstream) author claimed that the power of writing is that it "reveals us startlingly to ourselves as creatures set down here bewildered." Nothing could be farther from the heart of science fiction. Ours is the Sense of Wonder, not the Sense of Bewilderment.

I recalled a poster at the University of Colorado mumble years ago advertising a movie on "Future Shock." The film included, so the breathless poster-maker assured us, "frightening" footage of artificial limbs *that could not be told from the real thing!!!* Frightening? The choice of adjective tells us much. An amputee might feel differently.

Shock is proportional to surprise. If you are convinced that Tomorrow Will Be Like Today and that Literature's Biggest Concerns consist of suburban

[8]Sorry.

[9]The fun comes when you go one step beyond. In *The Laughing Clone*, the genotyping was mooted by the fact that the suspects were identical clones. At a Nolacon II panel on Genetic Fingerprinting, Greg Bear (I think) pointed out that, inasmuch as heat destroyed the DNA, all future crime would be accompanied by arson.

[10]Asimov, Isaac. *Asimov on Science Fiction*, [Avon Books, 1981].

[11]That's what it is, isn't it? Credit Orson Scott Card with the label.

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ennui, bourgeois shallowness, and how, where, and with whom to copulate. . . .

Well, Tomorrow will always take you by surprise.

Future shock (fyōōcher shŏk), *n.* a sense of bewilderment felt by those who were not paying attention.

The Shape of Things That Came

"We hope that Professor Langley will not put his substantial greatness as a scientist in further peril by continuing to waste his time, and the money involved, in further airship experiments. Life is short, and he is capable of services to humanity incomparably greater than can be expected to result from trying to fly . . . For students and investigators of the Langley type there are more useful employments."

The New York Times, *December 10, 1903*[12]

"Tout ce qu'un homme est capable d'imaginer, d'autres hommes seront capable de la réaliser."

Jules Verne.

[12]Better that they should spend all that money here on Earth, right? By the way, why don't you quickly go and check the date of the Wright Bros. flight. I'll wait.

●Campbell introduced the readers of the July 1939 issue to "a new author" whose story "presents a new type of obstacle that may face the first rocket ship's inventor." The new author was a kid named Asimov and the new obstacle was public opposition to space flight, based on a resurgent religious fundamentalism. The story, "Trends," was set in 1973. Religious fundamentalism and anti-science hysteria in 1973? What a crazy notion!

Religious fundamentalism also formed the background of Heinlein's yarn, "If This Goes On . . . ," which appeared in the February and March 1940 issues. Heinlein postulated a charismatic preacher backed with megabucks and with access to *television* (of all things) sweeping the country with revivalist fervor. (Sounds absurd, I know.) The resultant theocracy halted space travel and scientific research and imposed strict moral standards on everyone but the

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preacher himself.

There is something disturbingly familiar about those scenarios, although the special hatred of the fundamentalists nowadays seems reserved more for biogenetics rather than space travel.[13]

●Asimov's story featured a Federal Scientific Research Investigatory Bureau to rule on the legality of all scientific research. In Randall Garrett's story, "Damned if You Don't" (May 1960), it was Big Business, not Fundamentalists, who tried to supress scientific innovation, in this case, the invention of cold fusion (on a tabletop!) Garrett also imagined a government agency in place to regulate the rate of technological progress—ostensibly to "protect the people" but in fact to protect entrenched interests. Nowadays there are government bureaus and commissions aplenty "protecting" us from the dire consequences of scientific research. I suppose the government will run science about as well as it runs land wars in Asia.

The insurance companies in Heinlein's "Life Line" (Aug. 1939) went beyond suppression. They had Dr. Pinero murdered —because his method of forecasting death would bankrupt them. Heinlein did not treat Big Business kindly. During one scene in "Life Line," a judge comments: "There has grown up in the minds of certain groups in this country the notion that because a man or corporation has made a profit out of the public for a number of years, the government and courts are charged with the duty of guaranteeing such profit in the future, even in the face of changing circumstances and contrary to public interest. This strange doctrine is not supported by statute nor common law. Neither individuals nor corporations have any right to come into court and ask that the clock of history be stopped, or turned back."

Any connection you want to draw between that statement and current protectionist sentiment will be of your own devising. But I did read in the paper recently of an enzyme injection that would cause cows to increase their milk production. The enzyme is purely natural. It's what the *cow* uses. A panel is now being formed to evaluate the "economic impact" of cheap, plentiful milk, not on children suffering malnutrition in the inner cities, but on milk farmers who are "entitled" to a fair price. (There is also environmentalist opposition. The enzyme may be natural, but injecting it ain't. But then, environmentalists are primarily middle/upper class. They'll be getting their milk, regardless.)

●Walt and Leigh Richmond's protagonist, Wally Short, had to contend with indifference rather than hostility from the Establishment. In "Shortsite" (Apr. 1964), he invented a superconductor that functioned at (get this) room temperatures. *Analog* readers learned more about high-temperature superconductors in the July 1970 issue, in Edward Waltersheid's fact article, "Zero Resistance." The public learned about them a few months ago.

[13]Still . . . What if Falwell & co. or Rifkin & co. had arrived *prior* to the Mercury-Apollo program?

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"That Professor Goddard and his 'chair' in Clark College and the countenancing of the Smithsonian Institution does not know the relation of action and reaction and of the need to have something better than a vacuum against which to react—to say that would be absurd. Of course he only seems to lack the knowledge ladled out daily in high schools . . ."

The New York Times, *13 January 1920*

"Landing and moving around the moon offers so many serious problems for human beings that it may take science another 200 years to lick them."

Science Digest, *August 1948*

●In "Lee Correy's" serial *Shuttle Down* (Dec. 1980-Mar. 1981) the Shuttle *Atlantis* makes a forced landing on Easter Island.[14] Granted, the fictional disaster was not of the proportions of the *Challenger* tragedy; but why was it that only science fictioneers seemed aware that a failure was not only possible, but probable? We will leave out of account the meretricious behavior of the bureaucrats in government and industry who worked so hard to increase that probability. The fact is: Nothing works *all* the time. Has anyone ever heard of an experimental airframe that on *only its twenty-fifth flight* was considered safe enough to carry schoolteachers?[15]

In Dean Ing's "Tight Squeeze" (Feb. 1955), we read that "the *Wyld*, one of the first ships to be built, had made only two orbits before being destroyed. . . . The resultant explosion caused such destruction that, had there not been a number of men in orbit and waiting for supplies, the (space) project might have been halted, 'temporarily.' " Too bad SpaceLab was not still up there when *Challenger* exploded. Not being aware of the dangers in the first place, the public swung from thinking the shuttle "safe" (compared to what?) to thinking it "dangerous" (compared to what?).[16]

●"Tight Squeeze" concerned the difficulty of making in-flight repairs to a malfunctioning spaceship while hampered by a spacesuit, a fact no doubt appreciated by the crew of Apollo 13, among others. And that reminds me of John Berryman's story "Stuck" (June 1964) regarding an astronaut sent up by shuttle to repair a communications sat-

[14]Not long after, I read in the paper that NASA was negotiating with Chile to expand the runway on Easter Island to accommodate the odd shuttle or two.

[15]Part two of Richard Feynman's autobiographical *What Do You Care What Other People Think?* (Norton, 1988) details his experiences on the Rogers Commission. Read it.

[16]By the way, John Campbell noted in the intro to the Jan. 1968 Fact Article, "The Bugs that Live at −423°," that "Liquid hydrogen . . . leaks rapidly through 'airtight' joints."

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ellite. Crazy stuff.

●In February 1965, *Analog* readers were able to preview the Apollo program in Joe Poyer's Fact Article "Program for Lunar Landings." The timetable then envisioned established a medium Lunar base with a 4 to 10 man crew by 1977, expanding to 30 to 80 man crews by 1980. But that was before we realized that the whole thing was a political propaganda stunt. Except for the X-series spaceplanes, we have never had an honest-to-goodness space program at all; and, in a certain real sense, I am still waiting for the First Landing on the Moon.[17]

"What can be more palpably absurd than the prospect held out of locomotives traveling twice as fast as stagecoaches?"

The Quarterly Review, *1825*

"The ordinary 'horseless carriage' is at present a luxury for the wealthy; and although its price will probably fall in the future, it will never, of course, come into as common a use as the bicycle."

The Literary Digest, *14 October 1889*

"The popular mind often pictures gigantic flying machines speeding across the Atlantic and carrying innumerable passengers . . . [E]ven if a machine could get across with one or two passengers the expense would be prohibitive . . . Another popular fallacy is to expect enormous speed . . . The resistance of the air increases as the square of the speed and the work as the cube . . . It is clear that with our present devices there is no hope of competing for racing speed with either our locomotives or our automobiles."

William H. Pickering, US Astronomer, c. 1910

●The navigator in "Tight Squeeze" was a Chicano named Ruiz. The crewmembers in Jay Williams's "Beast of Prey" (Dec. 1957) included Hakim and Lermontov. Harry Harrison's "Rescue Operation" (Dec. 1964) took place in Yugoslavia; and the Terran soldiers sent to a planet of teleporting aliens in Joe Martino's ". . . Not a Prison Make" (Sep. 1966) were all Thais. Mack Reynold's "Figid Fracas" stories during the '60s regularly featured "good" Russian characters (and dared to suggest the future "liberalization" of the SovWorld and the winding down of the Cold War). These examples of internationalism are

[17] I do *not* mean that it was faked in Hollywood. I mean that the Goal was "To Beat the Russians to the Moon" not "To Achieve Lunar Spaceflight." Get the difference?

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just random bits culled from memory and from browsing. Williams's implication in 1957 that Russians and Americans would crew spaceships together would probably have startled non-science fiction readers back then. You might as well imagine a Klingon on a Federation star cruiser! However, we SF'ers knew that Earth was One Planet long before that famous Apollo picture from the Moon. After all, who came up with the sobriquets "Terran" and "Earthling" to replace nationalistic labels?

●For that matter, H. Beam Piper's protagonist in "Omnilingual" (June 1957) was a woman philologist on Mars who deciphers the inscriptions of the lost Martian race. The character's sex was not "necessary to the story." The story would have worked just as well had she been a male; but Piper was known for creating strong central female characters "long before it became politically expedient." Consider Princess Rylla in "Gunpowder God" (Nov. 1964) as just one more example. I also recall an *Analog* story regarding the first woman astronaut (a physicist) and the chauvinistic reactions of her two test pilot/engineer crewmates. Early '70s, I think, but I haven't tracked it down.

Heinlein, as usual, beat everyone to it, in "Delilah and the Space Rigger" (c. 1948, *not* an *Analog* story, but part of his Future History). The construction superintendent building Space Station One was upset to discover that his newest crew-man was a crew-woman. Heinlein postulated a "Fair Employment Commission" whose rules stated that sex could not appear on the application form.[18] The story concerned the superintendent's consciousness-raising, using arguments that sound extremely modern even some forty years later. (In one scene, Dad reminds Tiny that "there are women spaceship pilots.") In "We Also Walk Dogs—" (July 1941) Heinlein's protagonist is female, helps run a large company and, by the way, even though she is married, she uses her maiden name.

●Now none of this means that *Astounding/Analog* was a hotbed of internationalism, civil rights and women's lib. Science fiction, like most fiction of the '30s, '40s, and '50s, was written by and about white males. Well, people write about what they are most familiar with. Yet, it is my feeling that this bias was less strong in science fiction. Compared with alien fungus creatures from the fourth galaxy, what does the relative amount of melanin or testosterone matter? Others may feel differently. I have no data. All I can say is that that was my experience.[19]

[18]As an exercise for the reader, consider the distinction between an "*Equal* Employment" Commission and a "*Fair* Employment" Commission.

[19]Face it: excepting strongly ethnic names, if a character's race is not mentioned in the story, why do you *assume* it is white? Perhaps the reader brings something to the interpretation as well. (Parenthetically: I was taken to task by one letter writer for making the protagonist of *In the Country of the Blind* a black woman. "I know it is good one-world propaganda," he wrote; but he kept waiting for her blackness to be of some advantage and wondered why it was "necessary to the story." Well, it's a long struggle and it ain't over. How about a story in which the protagonist is white because his whiteness is "necessary to the story"?)

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"The actual building of roads devoted to motor cars is not for the near future, in spite of many rumors to that effect."

Harper's Weekly, *August 2; 1902*

●Mack Reynolds wrote a great deal during the sixties about a future cashless society. Everyone has these little plastic cards, see? And they stick them in slots and make purchases. He didn't precisely envision the Home Shopping Network; but what the heck? I don't think anybody could have made *that* up. Reynolds also introduced me to computer crime and computer sabotage. In "Romp" (Oct. 1966), Rosy and his pals reprogrammed a computer to alter credit balances. Rosy bugged out when the cops showed; but he was packing heat, so they caught him at the shuttleport with a metal detector. (Metal detectors at airports? What crazy idea will they come up with next?)

●Well, try this: In Reynolds's "Computer War" (June/July 1967), low-tech Betastan defeated an invasion by high-tech Alphaland by planting viruses in their government computers.

●Christopher Anvil's story "War Games" (Oct. 1963) featured a computer-animated tabletop battle game on exhibit at an electronics show. People found it difficult to tear themselves away from the game. (I know "computer games" sound incredible, but bear with me.) Eight years later, Albert Kuhfeld wrote a fact article called "Spacewar" (July 1971) which described a real battle game at MIT fought between two spaceships on a computer screen.[20] But John Campbell blew it in his intro when he wrote: "I'm afraid it will never be widely popular. The playing 'board' costs about a quarter of a megabuck." Of course, that was before Stephen Kallis's fact article, "Minicomputers" (May 1973). For that matter, Martin Buchanan wrote in "Home Computers Now!" (Nov. 1977) that the components for assembling a complete home computer could be obtained "for the price of a family car." From a quarter of a megabuck to the price of a car in six years! Odd, isn't it, how even our wildest imaginings can so often turn out to be conservative?

Fritz Leiber's classic "64 Square Madhouse" appeared in May 1964, in *IF*. It told of a computer entered in a chess tournament. The computer didn't win, but it performed respectably. In the August 1972 *Analog*, George R. R. Martin reported on a real computer entered in a real tournament ("The Computer was a Fish"). It didn't win, but performed respectably. Now you can buy chess-playing computers practically for pocket change.

[20]One of the game players was named Stan Schmidt.

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●Speaking of games . . . "Bullard Reflects," by Malcom Jameson (Dec. 1941) featured a sport in which players bounced pulses of laser light around with mirrors. It was all done in vacuum and zero-gee, of course; but the costume in the story illustration looks oddly like the get-up worn for those "Lazer Tag" games you can buy at the toy store. Of course, they don't *bounce* the light beam, but . . .[21]

●Nowadays, we take them for granted; but when Ben Bova wrote "The Next Logical Step" (May 1962) or Christopher Anvil, "A Question of Attitude" (Dec. 1967), there were no such things as simulators. In Ben Bova's story, the simulator played nuclear war scenarios. Every scenario ended in catastrophe, despite the protective satellite network.[22] This led the joint chiefs to conclude (as did the computer in the movie *War Games*) that there was no winnable nuclear war and the "next logical step" was to see to it that the Russians were able to steal the secret of the simulator.

●I suppose, since we are talking about computers, we should also mention robots. Of all his fictional "predictions," Isaac Asimov is proudest of his robots, and especially of the Laws of Robotics. His story "Reason" (Apr. 1941) was the first to deal with robots in a rational way. Previous stories had always ended with the machines killing their creators, a holdover from 19th century romanticism and religious fundamentalism. The Frankenstein Complex saw this ending as the inevitable outcome of "meddling in things not meant for us to know." The Good Doctor saw that robots would behave like logical machines, and not as Instruments of Divine Retribution.

We do not yet have self-aware robots.[23] But we do have autonomous programmed robots, such as the various interplanetary probes and the Mars Rover (which *Analog* readers read about in Sutro & Kilmer's Fact Article, "MR Robot" [May 1970]) AI Fighting Machines like Keith Laumer's "Bolos" and Colin Kapp's "Gottlos" are the precursors, too, of today's computerized weapons.

Creating awareness in robots isn't easy, as *Analog* readers learned from Dwight Wayne Batteau. His article "How to Make a Robot Speak English" (Aug. 1964) showed how difficult that "simple" task was. Talking computers are routine nowadays. And, in the July 1967 issue ("Annual Report of Listening, Inc."), he described how robots could be made to recognize their physical surroundings through the adaptation of dolphin-like sonar and even to distinguish different types of material through "color" sonar.

[21]It would not surprise me to learn that the inventor read the Bullard stories in his or her youth.

[22]A defensive shield can be overwhelmed by sheer volume because it is "cheaper to build a deterrent than to defend against it." Who else but Ben Bova would bring up SDI in 1962?

[23]Or do we? How would we *know*? Maybe they're just keeping quiet about it. . . .

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"There is no plea which will justify the use of high tension and alternating currents, either in a scientific or a commercial sense."

Thomas A. Edison, 1889

"I must confess that my imagination, in spite even of spurring, refuses to see any sort of submarine doing anything but suffocating its crew and floundering at sea."

H. G. Wells, in Anticipations, *1901*

●*Analog* did not neglect the ultimate computer, namely the human brain. I've already mentioned the "abstract vs. visual" brains in John Brunner's "See What I Mean!" Nowadays we would say that some of the characters were Left-brained and others, Right-brained. Left and Right brains have become very popular in pop psychology, management seminars, and the like; but *Analog*ians got the straight scoop in "The Split Brain," by J. Eric Holmes, MD (Aug. 1974). This was a Fact Article that described research on people whose hemispheres had been surgically severed. The reality of the "dual brain" is, of course, both less simplistic and more fascinating that the currently popular mythology.[24]

Verge Foray used the dual brain concept fictionally in "Duplex" (June 1968). His protagonist's brain hemispheres had been severed in infancy, then later rejoined. In the meantime, each hemisphere had developed its own personality. The tale had much to say about "disabilities." The mute half was a nocturnal secret agent. The speaking half was a concert pianist.[25]

●The brain transplants described in R. C. FitzPatrick's "Second Seeded" (Jan. 1966) have not come to pass; but we're transplanting nearly everything else. In "The Ghoul Squad" (June 1969), two years after the first successful heart transplant, Harry Harrison speculated on what would result "when the immune response was finally overcome in the seventies . . ." He imagined the need for organs far outstripping the available supply; a donor shortage. While other writers were creating dark worlds of organ-runners and people being killed for their body parts, Harrison stuck to a realistic projection. In his story, accident victims were automatically considered donors unless they carried a card that declared otherwise. This "prediction" was 180° "correct." Accident victims are automatically considered *not* to be donors unless they carry a card that declares otherwise. But what the heck? The whole idea was crazy stuff in 1969.

By the way . . . I'm going to interject a comment here. Harrison's story was

[24]And why is it that the "intuitive" Right Brain is the one that is always praised? Books teach us how to "tap the potential" of our right brains. Hell's bells! Too many people don't use *either* half.

[25]Ever try playing the piano by the committee method? Remember, each hemisphere controlled *one* hand.

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not *about organ donors and transplants. It was about people; in particular about a country sheriff whose daughter had left her I-am-not-a-donor medallion at home; was killed in a car wreck; and was cut up for parts. As Stan Schmidt has written elsewhere, the intent of* Astounding/Analog *was to feature "thought-provoking stories about believable people in situations created by new developments in science and technology." That this article concerns technological gimcrackery should not cause us to lose sight of that fact.*

"Nobody now fears that a Japanese fleet could deal an unexpected blow at our Pacific possessions . . . Radio makes surprise impossible."

Josephus Daniels, former US Secretary of the Navy, 16 October, 1922

"The day of the battleship has not passed, and it is highly unlikely that an airplane, or a fleet of them, could ever successfully sink a fleet of navy vessels under battle conditions."

Franklin D. Roosevelt, US Ass't. Secretary of the Navy, 1922

"As far as sinking a ship with a bomb is concerned, you just can't do it."

Rear Admiral Clark Woodward, USN, 1939

"Tora! Tora! Tora!"

Japanese aviator, 7 December, 1941

●Those of us working in the quality profession saw it coming a long time ago; but to the general public the economic upsurgence of Japan is something new. Unless they read "A Thing of Beauty" (Jan. 1973) by Norman Spinrad, in which the newly wealthy Japanese were buying up national treasures from the impoverished Americans. I believe the story ended with us selling them the Brooklyn Bridge.

●I first encountered the term "ecology" in *Analog*, and I remember trying to discuss it with fellow students not so well informed. The typical story played off the resilience and complex interactions found in even the simplest ecosystem. "Balanced Ecology" (Mar. 1965) by James H. Schmitz; "The Plague" (Nov. 1970) by Keith Laumer; and "Ecological Niche" (Dec. 1970) by Robert Chilson are a few examples.[26] Chilson's story recounted the "infestation" of a perfectly designed arcology by all sorts of wildlife. The ecologist brought in to "cure" the problem concluded that life adapts (e.g., ants were eating the organic grease used in much of the equipment). And besides, people *liked* the birds and such that had found their ways inside.

[26]The "resilient ecosystem" is a contrast to the "fragile ecology" so beloved of the ad-mass media.

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●"The Biggest Oil Disaster" (Feb. 1970) by Hayden Howard may conjure thoughts of the *Exxon Valdez*, except it involved a blowout of an off-shore oil rig. As usual, the *Analog* story involved the conflict between those who try to fix the problem and those who try to fix the blame.

●"Extinction of Species" (Apr. 1964) by Bert Kempers pointed out that most species have become extinct without any assistance from humankind and that pre-technological societies like the Amerindians, Hawaiians and Easter Islanders have accounted for more than their share of extinctions.

John Campbell was fond of pointing out that "you can't do just one thing." For example, in his editorial "Ecological Notes" (Jul. 1971), he cited the replacement of leaded gas with unleaded gas, a move which he himself had supported. Leaded gas gave off lead bromides, which was clearly unhealthy. But *un*-leaded gas gives off carcinogens. The irony is that we can treat lead poisoning, but not most cancers.

●In "Bring Back Those Mustard Plants" (Dec. 1957), Paul Leavy discussed the possibility of CO_2 poisoning during long space voyages, but he also mentioned CO poisoning here on earth, especially from car exhausts: "A good many city dwellers probably suffer from CO poisoning to a mild degree without realizing the source of their weakness." As far as CO_2 buildup in the atmosphere of Spaceship Earth, *Analog*ians could read "Carbon Dixoide and Climate" by John Gribbin in the Jan. 1970 issue.[27]

The greenhouse effect and the eventual exhaustion of fossil fuels also figured in "Hydrogen Fusion Reactor" (June 1965) by Edward C. Waltersheid. Not only was 1965 "pre-greenhouse" and "pre-resource depletion" (at least in the mass media); but it was also "pre-fusion." Today, of course, all three are Big News.

[27]Or they could wait until 1989 to read about it in the ad-mass media.

"The energy produced by the breaking down of the atom is a very poor kind of thing. Anyone who expects a source of power from the transformations of these atoms is talking moonshine."

Ernest Rutherford, physicist, ca. 1930

●Speaking of Nuclear Power . . . There were no nuclear power plants when Heinlein wrote "Blowups Happen" (Sept. 1940) or when Lester Del Rey wrote "Nerves" (Sept. 1942). The former involved a narrowly averted "Chernobyl" style disaster. The latter addressed the psychological stress under which power plant operators would work. (Ironically, I read in the papers of a nuke that was shut down because the operators were too un-stressed: They were goofing off, playing computer games, flying paper airplanes and the

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like. Perhaps the plants are designed *too* safely! A more finicky operation might keep operators on their toes more.)

●Heinlein's solution was to put the power plant into orbit and *beam* the power down to Earth. A number of stories back in the '30s and '40s involved "beamed power" or "radio power" replacing high tension lines. It sounded crazy at the time; but radio-this and radio-that was all the rage back then.[28] There is a "beamed power" relay tower not too far from my house. Nobody in the '30s thought to call it "microwave" power.

By the way, an important subplot in Heinlein's "Waldo" was the debilitating physical effects of long-term exposure to low levels of power beams. Whether it is true or not of people living near microwave receivers or rectennas remains to be seen. What is remarkable is that someone was wondering about it in 1942.

●What about solar power and alternative energy sources? Solar power satellites were quite common in SF; but one of the first stories concerning solar power directly was Heinlein's "Let There Be Light" (alas, in *Super Science Stories*, May, 1940), in which two scientists (one of whom was a woman) invent panels that convert sunlight into electricity.[29] Big Business was not happy about the idea of small-is-beautiful, decentralized power sources and tried to stifle the invention.

On the Fact Article front, Henry Sauter's "Solar Heating and Wind Power: Available Today!" (Jan. 1976) described the world's first passive solar home.

●"Magnetohydrodynamics" was another alternative energy source, described by Ben Bova in a May 1965 Fact Article. Bova was quite enthusiastic about MHD. "Plasma physics and MHD will be the backbone of man's newest technology." Alas, private investment dried up when the government wouldn't foot the bill. When the pilot plant was finally built, it was built outside Moscow.

●In "How to Design a Flying Saucer" (Sept. 1972), Richard Rosa showed how MHD could be used to construct a V/STOL craft, the flying aircar so beloved of SF writers. (The aircar is another example of how the future is most effectively realized as *background* to the story. Many tales were written in which characters traveled by aircar; I know of none that were *about* aircars.) Some people point to hovercraft as a realization of the aircar; but I caught a news item just recently that promised the unveiling of an honest-to-goodness V/STOL aircar later this year.

●Speaking of transportation, the Roadcities of Heinlein's "The Roads Must Roll" (June 1940) have not ma-

[28]Don't forget there are people alive today for whom, in their youth, radios and vacuum tubes were the cutting edge of high technology. When my grandfather was three years old, his parents told him that two men had flown a few feet down a stretch of beach in an aeroplane; when he was 69, two men walked around on the Moon.... And he was able to watch it live from his living room!

[29]It is often disheartening to realize how many Good Ideas Heinlein did first.

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terialized. The moving conveyor belts are restricted pretty much to airport concourses. (Why don't they have them in malls? Or in certain downtown areas?) But the primary point of Heinlein's story was not the roadcity but the paralyzing power of transport workers' unions.

●Catch the weather reports lately? It used to be that the weather forecasts were based on studies of the local barometric pressure, cloud formations, etc. Plus reports telegraphed in from regions upwind. I know of one case where the radio jock based his forecasts of snow by watching the roofs of the trains as they came in from Pittsburgh. Heck, I used to forecast rain using a milk bottle, rubber band, balloon, and drinking straw.[30] Nowadays we have satellites giving us stop action pictures of the weather formations and accuracy has increased enormously.[31] One or two citrus crops saved from an unexpected frost have more than paid for the satellite program.

For a preview of weather satellites, you might check out "The Weather Man" (May 1962) by Jonathan Blake Mackenzie; "The Weathermakers" (Dec. 1966) by Ben Bova; or "Eviction by Isotherm" (Aug. 1938) by Malcolm Jameson. These stories also involved weather control, something which has not happened yet.

The Shape of Things that Haven't Come

"Prediction is very difficult, especially about the future."

Niels Bohr

". . . [I]t can be taken for granted that before 1980 ships, aircraft, locomotives, and even automobiles will be atomically fueled."

David Sarnoff, former head of RCA, 1955

Fair is fair. When talking about the Future According to *Analog*, we should also mention the visions that have *not* come to pass.

●We don't have space travel; not really. Although the Russians are close, with their space station under nearly constant occupancy. But where are the great wheels in orbit? Where is Luna City, let alone Marsport?[32]

●And we certainly don't have manufacturing in space yet; although the environmental implications are so profound one wonders why it isn't being pushed more. (Several stories in these pages have postulated a natural alliance

[30]You figure it out.

[31]Yes, I know. But it's always easy to mock the exceptions. Try keeping track of forecast versus history for a while. But you'll have to decide how to count a forecast of "80% chance of rain." Remember, that is also a forecast of "20% chance of no rain." Usually it's not the forecast that's wrong, but the inferences and simplifications that the weather clowns make on TV.

[32]Many Americans are startled to learn that we could not go back to the Moon today if we wanted to. The Saturn boosters are gone; the production line disassembled. The engineers and other experts, scattered.

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between the environmentalists and the space enthusiasts.) Meanwhile, the potentials of ZG manufacture have been extolled by Joseph Green in "Manufacturing in Space" (Dec. 1970), and G. Harry Stine in "The Third Industrial Revolution" (Jan. 1973).

●The cover of the July 1949 issue featured the Brookhaven Atomic Pile; but atomic power has not fulfilled the promise foreseen by *Analog*, though not through any technical drawbacks. Face it. There are those who, for diverse reasons, do not *want* power to be cheap and plentiful.

●In "The Equalizer" (Dec. 1964), Norman Spinrad postulated an Israeli atomic bomb. They are widely believed to have one; but as yet there is no definite proof.

●Bob Shaw's Slow Glass, featured in "Light of Other Days" (Aug. 1966) is also an idea still unrealized.

●Intelligent, self-aware computers are not yet; though some AI programs simulate them well enough.[33]

●Dolphin-mania seems to have died down. It now seems clear that the dolphin is not intelligent on the human scale, despite the number of *Analog* stories to the contrary. Too bad. On the other hand, Bernard Deitchman's "Chester" (June 1973) showed us primate intelligence in a realistic manner, long before the movie *Gorillas of the Mist*.

●Direct mind-computer links have always been very popular. For example, "Brain Machines" (Mar. 1975) by F. N. Stein[34] and, more recently, Robert Chilson's "Pocket Brain" stories. Bova's and Anvil's simulators, mentioned earlier, both played their scenarios directly into the brain. If that seems a little far out, consider "Alpha Wave Conditioning" (June 1971) by K. C. Keefe. Alpha waving has since become part of the California pop-psychology scene; still, it was interesting to read how the brain's electrical power could be used to run toy locomotives—and what goes one direction might just as easily go in the other. "Tak Hallus" used this theme in his story "Mr. Winthrop Projects" (Oct. 1971), which involved imprinting one person's thoughts onto another mind. And there are rumbles on the alpha wave front . . .

●The "emotional sonar" created by R. C. Fitzpatrick in "Winken, Blinken and πr^2" (July 1968) still seems rather fantastic. (Although . . . there have been recent advances in remote brain wave monitoring. Add that to "Alpha Wave Conditioning," some basic electronics, and . . . Is it still completely out of the question?)

●Telepathy was another popular *Analog* theme. We know mind-reading is possible because we can each read our own mind.[35] Not only were there innumerable stories that used it, but there

[33] I recall an *Analog* Fact Article about an early program that simulated psychiatric counseling. The program's responses could not be distinguished from those of a real psychiatrist. Which tells us something, either about AI or about Psychiatry.

[34] That has *got* to be a pseudonym!

[35] And if that doesn't strike you as something that needs explaining, it should. You're so smart you tell me how it's done.

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were fact articles, as well. "Telepathy—Did it Happen?" (Nov. 1969) by Reswick and Vodonik described some experiments conducted in Czechoslovakia that were all the more interesting because they were not flatly conclusive. And there was that odd letter in the July 1967 "Brass Tacks" from a woman who explained that she preferred to keep her telepathy a secret because she did not want to be treated as a freak or a witch.

No discussion of *Analog*'s past could be complete without mention of Dianetics, the Dean Drive, and Hieronymous machines.

●I am not sure if "Dianetics" (May 1950) can be considered a successful prediction. Is it really forecasting when the forecaster sets about to make the forecast come true? At any rate, Scientology was probably the first and only religion to be born in an SF magazine.

●Psionics was a special hobby horse of Campbell's from the early 1950s. He peppered the magazine with articles and stories on dowsing, the Delawarr camera, and other psychic phenomena. T. Galen Hieronymous allegedly invented a number of psycho-electronic devices, by which, *inter alia*, he killed caterpillars by treating photographs of trees. It was all very incredible, in every sense of the word. (Still . . . Could it be? Nah!)

●The Dean Drive is more mysterious. Campbell introduced it to his readers in "The Space Drive Problem" (June 1960). Dean had developed a machine that produced a "unidirectional force." So he claimed. G. Harry Stine, William O. Davis, and others investigated the phenomenon. Davis developed a theoretical basis for it in "The Fourth Law of Motion" (May 1962); but physical tests were inconclusive, due to Dean's refusal to cooperate. Still, Stine and his colleagues detected *something* that they could not account for by ordinary Newtonian mechanics; and, as Stine wrote in "Detesters, Phasers and Dean Drives" (June 1976), the issue is still unresolved.[36]

Along the Dew Line

SF functions like a Distant Early Warning system. Like the DEW Line radars in the far north, it is supposed to give us advance warning of what is coming. Especially if what is coming is unpleasant. John Campbell renamed *Astounding*, *Analog* in 1960 partly for this reason. He saw the role of Science Fiction as "flying paper airplane analogs of possible realities. Unfortunately, while SF is rather good at foreseeing problems, it is not so good at foreseeing answers. No put-down intended. Not many others even see the questions.[37]

Analog continues to be a hard science fiction magazine. New ideas appear in its pages nearly as soon as they do in the technical literature; and often long before the public gets wind of them.

[36]Campbell was just as interested in the scientific establishment's refusal to test the device as he was in whether the device worked as claimed or not.

[37]Besides, if SF authors could see the answers, do you think they'd be pounding out stories for a few pennies per word?

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This article has only touched on a few of them. In more recent years, we have read about Memes, "Far Out Psychics," "24th Century Medicine," cell repair machines and other nanotech notions, Hypermedia, Bobbles, the Vinge Singularity, and more. Some of these are surely the Hieronymous machines of their day. Others? Who knows? Our grandchildren may well take them for granted.

I could go on. But this disjointed and personal assessment must come to an end. Ye Esteemed Editor, S^2, has only so many pages at his disposal, and I have already used too many. No doubt he will trim the length of this article; but he will wield the editorial pencil with such subtlety and precision that ■

A NOTE FROM THE ARTIST

Sixty Astounding Years! A dream assignment! When I got the manuscript in the mail I burned the phone lines to the offices.... "I've been dreaming about this painting for five years!" Well, actually, I wasn't entirely sure what the point of view would be... from in front of the newsstand, as you see here, or from the viewpoint of the vendor, in which case it would have probably been (and may yet be) a candy stand, with a couple of alien toddlers trying to figure out how to squander their allowances.

But *this*... a chance to repay in some small part the people whose influence on my life and career has been so instrumental... *this* was an extraordinary opportunity!

In true "What If..." and "Why Not..." spirit, each of the covers was digitized into a 512K Commodore Amiga 1000 personal computer with NewTek's "Digiview 1.0", then converted to a grey-scale image with Electronic Arts' "Deluxe Paint II" and Octree Software's "Butcher 1.0" image processing functions. When I printed the results out on an Epson-clone dot-matrix printer, this became the rough sketch for the illustration.... *in one day.* The next logical question is, naturally, "If This Goes On...?" (Once the sketch was done, I still had to *paint* the things... but I still think Mr. Campbell would have approved.)

There are notable omissions, which I will even more deeply regret should I discover they were due to my own shortcomings in research and perseverance. Theodore Sturgeon is not represented here, and should be. The same holds true of Chesley Bonestell, Alex Schomburg, E. E. "Doc" Smith, Algis Budrys, Arthur C. Clarke, Richard Powers, Phillip K. Dick, and God forgive me, I can't find *any* of my issues with Doctor Forward's "Rocheworld" installments, nor the exquisite work that H. R. Van Dongen did for that masterful story. There are others, but these are the ones that make me weep.

This piece *did* give me a once-in-a-lifetime opportunity to give a deeply felt thanks to many of the others to whom I owe much. Not in any particular

(continued on page 233)

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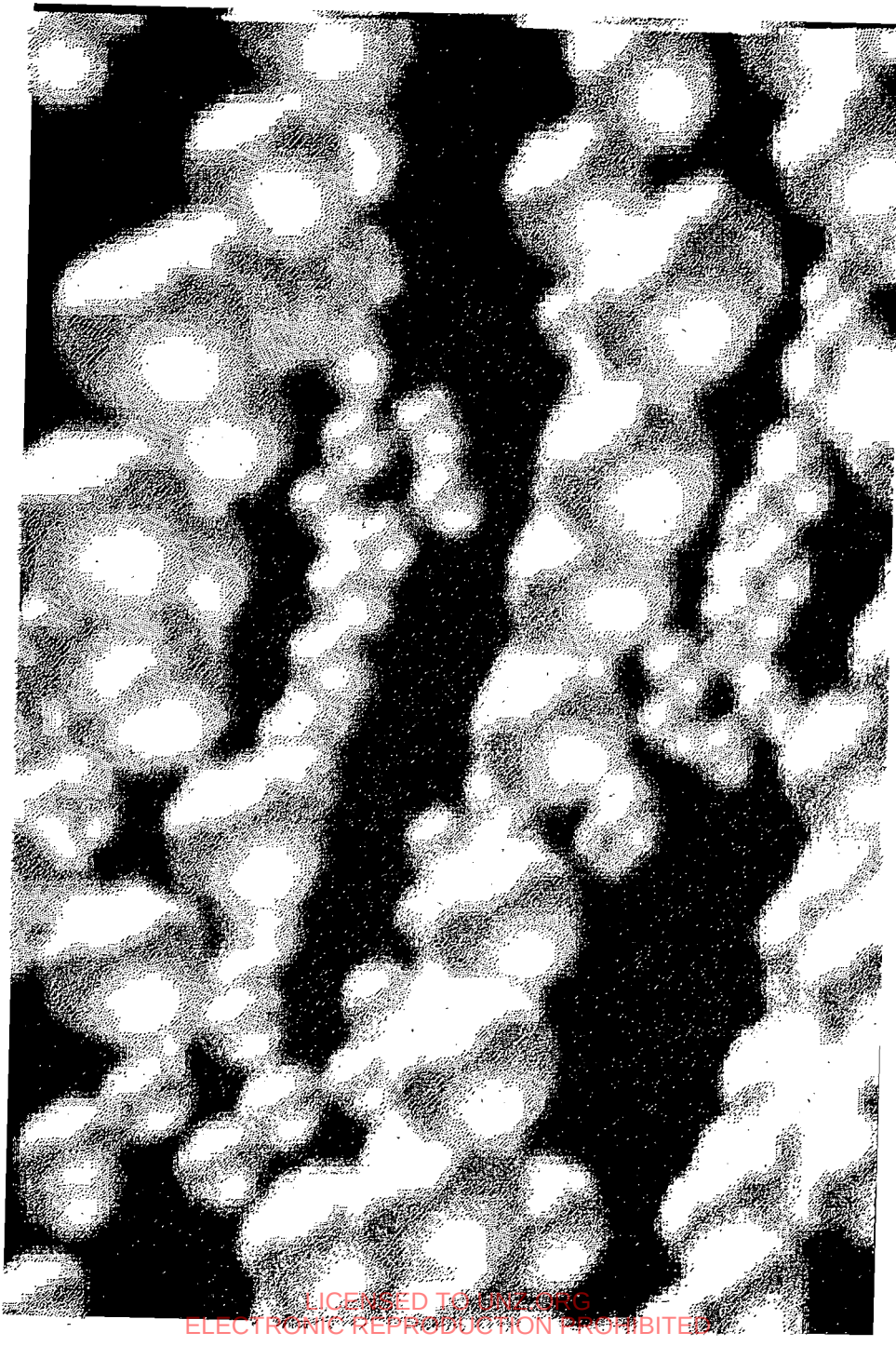

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William R. Warren, Jr.
Charles Sheffield
THE DOUBLE SPIRAL STAIRCASE
Thanks to modern technology, we've all received mail that looked personalized but might as well have been addressed to "Occupant."

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Seventy degrees. February 1st in Washington. It had no right to be so warm and pleasant. But who was going to complain?

Not Jake Jacobsen. A Waldorf salad, a flounder shipped over fresh that morning from the fishing boats on Maine Avenue, a medium steak, a couple of drinks—well, make that three or four, enough to get a nice little buzz on but not enough to show—and then a leisurely stroll across the Mall back to Independence Avenue; that was what today's blue skies demanded. That was what they got. As he walked, skirting the banners and noisy fervor of a group of Animal Rights Activists, he thought of the old Navy traditions; of raging seas, salt pork and weevil-filled hard tack, foul water, shipwreck, starvation and scurvy. Things had improved quite a bit in two hundred years.

In fact, the only thing missing now was a cigar, a nice Havana Corona.

He vowed to remedy that, as soon as he was back in his office. Smoking was illegal in government offices, but RHIP.

He didn't wear his uniform in the daytime (no point in rubbing it in with the old staff, they still resented the change) but the guards on the front entrance saluted him anyway. As they should. They were all Navy now. He returned the salutes automatically, and walked to the elevators that would take him to the seventh and highest floor, up to his corner office that looked north toward the green expanse of the mall.

Now *there* was one hell of a contrast. He had been five years locked up in the windowless bowels of the Pentagon, designing the master plan, choreographing industry and OMB and congressional support. And then, at last, had come the exquisitely timed *coup*—there was no other word for it—that brought the agency under Navy's wing, and him his third star and the position of NASA Administrator.

In fact, he thought as he left the elevator, today's lunch could well be thought of as a small celebration. It was six months to the day since the Act had gone into effect, just two months since his hearings had confirmed him in this job. The war was certainly not over—the damned Air Force would never stop trying to take the lead role in space, he knew that. There were tough times ahead, but he had won the first two battles.

Admiral Jacob Jacobsen pushed open the door of his office, walked to his desk without looking around him, and sat down.

And at that point all of his lunchtime euphoria evaporated.

Someone was already there, in the Important Visitor's seat. There, despite his sternest orders that no one, not even his own wife (hell, least of all his wife) was to be permitted entrance to his office without his approval. And he would certainly never have approved the admission of the scruffy object who sat opposite him.

It had to be that witless oaf Trustrum again, the worst apology for an aide that a man ever had to endure, ignoring direct orders and letting people in using his own sadly inadequate judgment.

Jacobsen thought for a wistful moment of the old Navy. Not everything today was an improvement. Two hundred years ago he would have had Trustrum flogged for such a gross failure to obey

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orders. Today, with NASA's insistence on retaining some elements of civilian function, about all he could do was to put an unfavorable and strongly worded memo into Trustrum's personnel file when what he really wanted was to have the man keelhauled and hung from the yardarm. But Trustrum's wife was the vice-president's cousin, and even a memo would probably be pulled before it got into the record. Christ. *Everyone* was somebody's cousin, or uncle, or bedmate, or best college friend. Sometimes he felt that the whole of Washington was glued together into one vast, incestuous, and inefficient snotball.

He stared at the stranger slumped in the chair opposite. The man was overdressed for the warm weather, in thick and shapeless woolen trousers and a heavy, leather-patched tweed jacket. He was also short and stooped and thin to emaciation, with an unhealthy pallor and jutting cheekbones. His remaining hair was combed forward in an unsuccessful attempt to disguise creeping alopecia, and his brown eyes bulged out like a dyspeptic frog's. And, unless Jacobsen's nose was playing tricks, the man smelled. No, he didn't smell, he *stank*. Of something worse than body odor.

Jacobsen grabbed a cigar from the humidor, lit it hurriedly, and put up a defensive smokescreen between them. He leaned far back in his seat.

"I've no idea who you are, Mister, or why you're here, but you can just answer me one question. How in the name of Nelson did you talk that jackass Trustrum into letting you into my private office? And when you've answered that, you can get the hell out of here."

The stranger didn't blink. He held up his hand and displayed a Naval Academy class ring. "I showed Trustrum your picture, Porky. Your picture and mine, next to each other—in the yearbook. That was all it took."

"Porky! Nobody's called me that for—" Jacobsen leaned forward, peering more closely at the other's protruding eyeballs. "Jesus Christ. The yearbook. Buggsie. Bug-eyes Bates? Is it really you? For God's sake, what happened? You look like hell."

The other man frowned. "Same thing as happened to you, old buddy. We got old. Take a peek in the mirror, you don't look too hot yourself. I bet your blood pressure is double your IQ. And that's not Styrofoam stuffed down your suit, it's a hundred pounds of lard. But we'll not get much done if we sit here trading smart-ass insults, the way we did in the old days. Don't you have the graciousness to offer a cigar to a classmate and a might-have-been—except for what you did, Porky—fellow *matelot?* Remember that?"

Buggsie Bates leaned forward and helped himself to a cigar as he spoke. He didn't light it, but sat there smiling an inscrutable smile.

Jacobsen cleared his throat.

"Hey, Buggsie, that was a long time ago. We were all young and wild. Nobody meant you any harm. I'm damned sure I didn't."

"Mebbe. But you doped her up and knocked her up and put her in my bed. And you went on and got the three stars, while I just got the shaft." Bates waved the cigar in a circular motion in the air. "It's all right, Porky. No need to start hunting for the panic button, I'm not

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here to settle thirty-year old scores from Academy days. And I'm going to give you more stars than you ever dreamed of. When they canned my ass from the Navy, that turned out to be the best thing that ever happened to me. I'd have made a terrible middy."

"You were already pretty bad." Jacobsen's curiosity was roused. "Buggsie, what happened to you? I know you left the Navy, but where did you go? You disappeared. I mean, if you're out on the street, I'll be glad to do what I can to . . . you know, you smell like—God, I don't know what. You smell like—no offense now—like you've been rolling around in a pile of ape-shit."

"Not too far from the truth. Add in bear-shit, and you're close." From the smile on Bates's face, the insult didn't worry him. Already, in less than five minutes, the two men had dropped right back into the easy relationship that had ended thirty years earlier. "Thanks for the offer of help, Porky, but I don't need it. In fact, I'm here to do *you* a favor. A big one."

Jake Jacobsen peered at Bates from beneath his most prominent feature, bushy eyebrows that together with his porker's nose and ample belly were the delight of the political cartoonists. "Yeah, sure. Buggsie, the last person who told me he'd come to do me a big favor is doing five years in Leavenworth instead. If you're working for a lobbyist, leave now. You can keep the cigar for old time's sake."

"No lobbyist, Porky. I don't really work for anyone, at least no one you'd recognize. You've moved up in the world, but so have I. After I got kicked out I did what I should have done anyway. Went to college—serious science college, not tin soldiers—and did a Ph.D., then moved west for a faculty position. Big man on campus. Full chair and tenured position now, at Simi Valley State."

"But you *smell*."

"There's a big animal experiment lab, and I spend time in it. Like they say, shit sticks." He lit his cigar, and nodded his head in satisfaction at the aroma.

Jacobsen pulled his desk calendar over to him and stabbed at it with a thick finger. "I don't have much time to chat, Buggsie." His voice was apologetic. "I have a meeting downstairs in fifteen minutes. Why did you come here?"

Bates was peering unashamedly at the calendar, reading it upside-down. "SETI. You're going to talk about the Search for Extraterrestrial Intelligence?"

"Sort of. There's been a two-day meeting on the fifth floor, all the big names. I met 'em. They're a bunch of dumb turkeys. So I'm going to drop the big one on them today, tell 'em their budget just went bye-bye."

"You're cutting them out?"

"To zero. They're not even going in below the line. It's a new ball game here, Buggsie. Since Navy took over this place, we're cutting out all the chickenshit and doing what we should have been doing in space for the past thirty-five years. Consolidating our position. Building space infrastructure and the permanent supply ports. Making a *policy*, and a real space program. You know, I'd give half my pension for a cheap space transportation system, but over the years we've pissed away billions on third world training programs

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and space telescopes and listening for little green men. And what do we have to show for it? You tell me. Well, all that stopped when I got the job.

"Here," Jacobsen stared at Bates with sudden suspicion. "You're not one of *them*, are you? That SETI crowd?"

"Not any more. I was interested for a while, and I guess I owe them something, because they got me interested in finding and deciphering hidden messages." Bates was rummaging around in the pocket of his tweed jacket. "That's certainly not why I'm here. I didn't know anything about your meeting, but I'm going to make it very easy for you to break the news to them. SETI just became irrelevant. Take a look at this."

He was holding a small oval cylinder of white plastic, the size of a packet of cigarettes. The curved top was featureless except for a stud that could be moved to five positions along a sliding scale, and a round dial like a tiny watch face in the center. Bates leaned forward and placed the unit on the desk in front of Jacobsen. He put his hand flat on top of it.

"Ready?" He moved the stud to the first position, then pulled his hand clear. The cylinder rose to eye level and hovered there, two feet above the top of the desk. "Position one. Stasis mode, I call it. It's set to cancel and return to position zero—off—after thirty seconds, but that's programmable. If you want it to, it will hover indefinitely long at any height."

Jake Jacobsen's eyes were bulging more than Bates's ever did.

"Or it will do this," said Bates. "Position two. Constant velocity."

He reached out to the little unit and moved the stud one notch farther along the scale. At a steady foot per second, the white plastic rose until it reached the soundproofed ceiling and remained there, pressing gently upwards. Jacobsen stared up at it, mouth gaping open.

"It's smart enough to know there's an obstacle," continued Bates, "so it just stays there without exerting any upward force. If the ceiling weren't in the way, it would keep on moving up at the same speed until cut-off time is reached. Then—depending how it's programmed—it will either stay where it is, or return at once to the starting point."

As he finished speaking the smooth-sided box drifted downwards until it was sitting on the desk top. Jacobsen reached out a pudgy hand and touched the side of the cylinder tentatively, as though it might be red-hot.

"It's not some sort of trick, is it? I mean, it really did what I saw it do."

"I'm not a hypnotist or a magician, if that's what you mean. You ought to know me better than that. And it's not a trick. It does what you saw."

"Then . . ." Jacobsen picked up the flattened white cylinder and put it on the palm of his hand, gauging the weight. "Then it's . . . it's . . . Christ. Did you *invent* this thing?"

"Not quite. Let's say I *discovered* it. And of course, all that I have here is a demonstration model. To be really useful, the cylinder ought to be as big as this room, then it could carry people. I didn't have the facilities to do that in the university machine shop, and anyway, that's not my department. It's yours. All I wanted to do is be sure it worked."

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"Is it anti-gravity?" Jacobsen peered at the red button on top of the smooth surface. "When you pressed it to that second position, it just went straight up."

"That's right. But it's more than anti-gravity, because it can go at a constant speed in any direction I choose. And it even does a lot more than that. See the other three settings? The first one puts the cylinder into a state of constant *acceleration*, for as long as the timer is set. I've tested it outside, and it went up, faster and faster, for twenty seconds. If I hadn't programmed it to switch off and return to its starting point, I guess it would just have kept on going forever. I've only tested the other settings in a lab environment, so there could be a surprise or two. But the fourth position seems to be a constant rate of *increase* of acceleration. You'd have to be careful with that in a passenger version. Even with only a tenth of a gravity increase per second—and it can do a lot more than that—you'd be up to six gee in one minute, enough to start flattening everyone on board. By that time you're going a mile a second. You'd make a sizeable dent in anything you hit. Don't touch that setting, by the way, I have no timer in the program."

Jacobsen put the cylinder down on the desk and pulled his hand away as though the plastic had suddenly become radioactive.

"The fifth position, though." Bates casually retrieved the object. "That's the real pay dirt. The unit just seems to disappear for a moment, then appear again at some preset distance away. I haven't been able to use separations big enough to measure the transition speed, but I know it's very fast. Maybe instantaneous."

The other man's face had been moving through a sequence of expressions as Bates described the functions of the flattened cylinder, running from amazement and disbelief to nervousness, and finally to squint-eyed cunning. When Bates finished speaking the admiral sat in silence for a few seconds, drumming pudgy fingers on the desk top.

"What's the power source? Some humongous generator, somewhere?"

"No. What you see is what you get. It doesn't have one. I'm not a physicist, but from what I've been reading it has to draw its energy from vacuum fluctuations. There's no practical limit."

"You say you didn't invent it?"

"I discovered it. Sort of stumbled across it."

"So where's the guy who *did* invent it? Why isn't he here?"

"There isn't any other guy." Bates raised a skinny hand. "Look, I know that what I'm going to tell you sounds off the wall, but the important thing is *this*." He hefted the cylinder. "You don't have to trust me. Fix your eyes on this whenever what I have to say sounds strange to you. The machine's *real*. You're seeing it work. Keep that in your head."

Bates turned the dial on top of the cylinder and moved the stud to its first setting. The unit rose to hover in the air just above eye level, between the two men.

"Let's start easy," Bates continued. "While you've been here at NASA you must have had questions about flying saucers, and visitors from space."

Jacobsen snorted. "Too damned

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many. We get a new inquiry every day. I told my staff what to tell 'em, that there's been a dozen investigations and they all show it's a bunch of garbage. Don't do much good, though, next day there's some other nut case on the line. I hope you're not going to sit there and tell me that a little man in a flying saucer dropped in on you and gave you the gadget?"

"Not quite. But you're warm. The best explanation I've been able to come up with is that somebody from far away *did* visit Earth, just the way your saucer fanatics insist. But it happened a long time ago. I don't quite know when, but it was over twenty million years. And before you ask me anything else, let me say I have no idea what they looked like, or their main reason for coming here. Whatever it was, they decided they'd leave a gift behind when they left. You're looking at it—the secret of easy access to space. Probably of interstellar travel, too, with that fifth setting."

"Wait a minute." Jacobsen was puffing furiously on his cigar, scowling from beneath those fierce eyebrows. "First you tell me you didn't *invent* it. Now you're saying they *left* it, whoever the hell they are. But you also said *you* built it."

"I did build it. What they left were instructions as to how to do it. I could follow the directions, but I still don't know *why* it works."

"Instructions?" Jacobsen's fat cheeks were turning crimson. Overdue for a stroke, he seemed to have decided that now was the time. "*Instructions!* Written in English, I suppose. Buggsie, I've had enough of this. You never did know when to stop joshing. If you think I was born yesterday—"

"Look at the machine, Porky. See it, hanging there? Have faith. Not instructions in English, of course not. Not in any human language. The instructions came as coded digit sequences, and they had to be deciphered. Your SETI friends waiting down on the fifth floor have worried about the same problem for a long time: if you did receive a signal from space that was of artificial origin, how would you figure out the message?" Bates had finally lit his cigar, and now he was staring thoughtfully at the glowing tip. "You know, I used to be quite a SETI fan myself, but when you look at it logically, sending radio signals here from space is a terrible way to communicate with anybody. If you're not listening at just the right time with an antenna pointing in the right direction, the signal has been and gone while you're looking the other way. It's worse than putting a note in a bottle, and throwing it into the ocean. Much better to do it this way, leave a message *here*, where it will be around whenever someone gets smart enough to look for it."

He glanced up at Jacobsen. "Where was I? I flew the red-eye from the Coast to get here, and I'm feeling a bit muzzy. Anyway, after a while I became convinced that what I had found *was* a message, but it took me forever to decipher it. The digital signal was a string of binary numbers, tens of millions of bits long. I knew it wasn't random, but I couldn't read it. Finally I discovered that the key was to convert the long string of digital signal into a two-dimensional array, laying a thousand and twenty-four digits down as each row,

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and then viewing the result as a pictorial form. And then I still had to puzzle out what the pictures *meant*. You see, until I actually had a working model, I couldn't be sure what I was building. For a while, I wondered if I might be making a gadget that would blow up the whole world—a sort of self-sterilizing device, left on Earth to get rid of any species that got smart enough to expand off the planet." He smiled unpleasantly. "Then I decided, what the hell, I'd build it anyway. I've learned a lot about animals. *Humans* might be that sneaky and horrible, but nothing else would."

The bright red had receded from Jacobsen's face, but he was stirring restlessly in his chair. "How many people have you told about all this, Buggsie? The message, and everything else?"

"Hardly anyone. Just a couple of coworkers at the lab, and I don't think they believed me. And as soon as I finished the working model I headed straight here."

"No public talks? No papers written?"

"None. Before I had a working model there was a problem of, let's say, credibility. This sort of thing isn't my academic specialty, and electronics is only a hobby. I'd have been laughed at until I had proof. Then when I had this working, I decided it was too important for anything like the usual publication route. We're talking a major press conference."

"Sure." Jacobsen picked up the inter-office phone and said: "Trustrum? Postpone my meeting with the SETI group. I know, I know. Screw 'em. And send a security officer up here to my office. Second thoughts, better make that *two* security officers, OK?"

He turned to Bates. "Buggsie, in the last year at the Academy I had you blackballed for the Jacks-off Five Society because I said you were all brains and no common sense. I have to apologize for that. I was wrong. You did exactly the right thing coming here to me without telling anybody. Do you realize the importance of what you have there?"

"Of course I do." Bates was scowling. "Why do you think I came to NASA? This gives us the stars—as it was designed to do."

"Nuts to the stars." Jacobsen walked across to the door to make sure it was securely closed. "I get too much crap in this job about stars and black holes and galaxies. That's for those SETI fruitcakes and their buddies in their meeting on the fifth floor. What we need right now are the *planets*. And that means a low-cost system to get off Earth, for starters. Navy and I took over NASA with a mission: to make it get its act together. The name of the space game today is *easy access*. I don't give the Russians credit for much, but they have the right attitude when they say that the upper atmosphere is the shore of the Universe. The first real space-faring nation will control the solar system, the way that Spain and Portugal and England used to control the seas. And that's going to be *us*, not a bunch of Russians and Japanese and Chinese and Frenchmen." He stared at Bates. The other man was shaking his head and there was a tired smile on his face. "We can do it, Buggsie. What you're holding in your hand guarantees it."

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"It gives *humanity* easy access to space. Not just America."

"Oh, sure. Others will get to go eventually—they'll ride our coattails. But you had the same history lessons as I did, back at the Academy, and you know how the world works. Control the ports, and you control everything else. Trade follows the flag. Our flag."

Bates sighed. "Porky, I hoped for better things from you. I read all those noble things you said when you were testifying at the hearings to become head of NASA. 'I conceive it as my sacred duty to build a staircase, one that will allow all of humanity to ascend to the stars.' And I was dumb enough to believe you meant what you said. I'm delivering the staircase to you, but you want to restrict its use. Well, it doesn't make any difference what you want to do, or what I want to do. This staircase can't be kept secret."

"We'll see about that." There was a buzz on the office phone, and Jacobsen levered himself out of his chair and went to open the door. Two jg's stood to attention outside. Jacobsen nodded to them.

"I want you to stand guard as long as this meeting is going on. We're at TS level in here until further notice." He closed the door and returned to his desk. "Buggsie, you've spent too long in that ivory tower. Isn't it obvious that what you've shown me makes this a national security issue, too? The future of this whole country is at stake, and if that"— he pointed at the cylinder, still hovering above the desk —"got into the wrong foreign hands, our defense systems wouldn't be worth a packet of peanuts. You started out right, coming to me. Don't blow it now. Work with Navy, and you'll be sitting right on the inside—I'll make sure you get all the clearances, and if you need money one of my contractors can write you a nice fat subcontract. But don't give me any crap about this being 'too important to keep secret.' Let me tell you, *anything* can be kept secret, if the screws are turned down tight enough. And this has to be."

Bates laid his dead cigar down on the desk ashtray. For the past two minutes he had forgotten to smoke it. "You still don't understand, Porky. I said this can't be kept secret, no matter how much you or I might want to do that. I told you I found a message. Where do you imagine I found it, written on a wall somewhere?"

Jacobsen glowered. "Damned if I know. But it was somewhere in this country, wasn't it?"

"Yes. I haven't been abroad for over ten years."

"Then let me tell you something, Buggsie old buddy. I spent years in Naval Intelligence, and I can guarantee that we'll be able to put a lid on the place—any place in the U.S. of A.—where that message came from; a cap so tight Harry Houdini couldn't get his little finger in or out of it. And we can make sure nothing appears in the press, and nothing gets published. Your space transport system will be produced in a maximum security environment that makes standard DOD Top Secret facilities look leaky as colanders. If that's not keeping a secret, I don't know what is."

"It won't work." Bates gestured at the hovering cylinder. "You say you

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thought I had no common sense. Use yours, Porky, if you have any left after twenty years of military BS. Suppose you were an alien, visiting Earth twenty million years ago, and you wanted to leave a message that could be read today. What would you do?"

Jacobsen puffed out his full cheeks. "Carve it somewhere permanent, on rock, or on a steel plate. No, gold or glass would be better. But twenty million years. . . ."

"You're getting there." Bates had an irritating smile on his face. "Take your time. Twenty *million*—not two hundred, or two hundred thousand. No artifact on Earth is that old. Any message would be worn away by the weather in less than a million years, so anything left on the surface would be eroded or buried hundreds of feet deep. Think, Porky. *Twenty million.*"

"It's impossible. Nothing can last that long."

"Right. That's what I wanted you to conclude. Nothing we could build would be recognizable twenty million years in the future."

"Not on Earth. But maybe if you left it on the Moon, where there's no weather to wear it out. . . ."

"Hey, nice try. I didn't expect that. But you'd still have to worry about meteor impact. There's a better way, right here on Earth. A way that allows messages to persist for *hundreds of millions* of years, with small danger of being lost. And it's a form of recording we almost know how to do ourselves, if we want to."

Jacobsen growled his annoyance. "I know you think you're so damn smart, Buggsie, you always did. It sounds impossible, but if you're going to tell me, get on with it. And while you're at it you can tell me why *you* found this, and nobody else."

"Because I smell of ape-shit and bear-shit. I told you I wasn't a physicist, but I didn't tell you what I am. I'm a biologist—a molecular biologist. And one of the hottest topics today in molecular biology is DNA sequencing. Do you know anything about it?"

"Never heard of it, and I'm not sure I want to."

"You do, if you follow government research financing. DNA is the molecule that carries genetic information. DNA also gets duplicated, unchanged except for very rare mutations, every time a cell divides. The Department of Energy and the National Institutes of Health have been given a billion dollars each to do DNA mapping of humans."

"A *billion?*" Jacobsen was finally dealing with something he understood. "That's not chicken feed."

"Not even by Defense Department standards."

"Sounds like another big R&D boondoggle to me. NASA is full of 'em."

"No. This one is important. You see, the DNA of an organism decides exactly what that organism *is*. If I specify your DNA, in full, I specify you. It might sound easy to do that, because although a DNA molecule is shaped like a double helix—a pair of interlocking spirals—you can think of it as one long string, open-ended or joined in a circle, of just four different chemicals called nucleotide bases. The chemicals are thymine, adenine, guanine, and cytosine—"

"In English, goofball. You're starting to gibber."

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"Sorry, Porky. I forgot you're a meathead. Just think of the bases in terms of their initials, T, A, G, and C, and imagine you have a whole lot of beads, with one of those letters written on each. Now you can make a necklace using those beads, with no restriction on which bead sits at which position on the necklace. A complete DNA sequence—it's called a *genome*—is just the listing of the order of the beads along the spiral necklace. That's enough to describe the organism completely. The difference between me and you and a cabbage or a mosquito or a chicken is in the length of the DNA sequence, and the order of the four chemicals along the sequence. The trouble is, we're talking of billions of beads for any sort of complex organism. Genome mapping is a monstrous job."

"And a damned useless one, I'd have said. What's the good of it?"

"All sorts of things. If we knew the DNA mapping exactly we could tackle all sorts of hereditary diseases. That's been known for thirty years. But techniques to map the DNA sequence, and find the exact order of the T, A, G, and C beads on the genetic necklace are more recent, ten years old or less. We do it using electron microscopes and crystallography and other chemicals called restriction enzymes. That's what I do. I'm good at it. The Department of Energy gave me a grant of a million dollars to look at a particular question relating to DNA sequencing, what you might call the problem of 'junk' DNA that doesn't seem to do anything useful.

"You see, the DNA in any cell tells that cell how to operate, especially how to produce proteins. So you might think that every bit of DNA would be used that way. But it isn't. As little as 10 percent of the DNA is used to control production processes in the cell. So what's the rest of it there for? Nobody knows. And yet the *introns*, those intervening sequences that don't direct production of cell materials, can make up nine-tenths of the total DNA. My grant was to examine the introns, and see if I could discover what purpose they serve."

Bates had been sitting completely motionless in his chair. With the explanation almost over, he seemed exhausted. Now he stirred, picked up the cigar again, and pointed with it at the hovering cylinder. "So here's the exciting bit. I found out, Porky. At least, I found out part of the answer. It's right there, hanging in front of you. *Somebody planted a message*, over and over again, in the introns, in the DNA sequences that look at first sight like some sort of junk. All I did was discover it and decode it."

Jacobsen was staring at the palm of his own fleshy hand with bemusement. "Are you saying that's where your space transportation system design is? Hidden away in the damned DNA sequence, like a coded signal? It's even inside *me?*"

"It sure is. It's in your hand there, hidden in the part of the DNA sequence that's not expressed in protein production. It's repeated many times, in case a bit of the sequence in one place is destroyed by a mutation. And don't you see the beauty of the idea? If DNA does one thing superbly well, it's this: it makes copies of itself, from generation to generation, with a miniscule error

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rate. Maybe after a few hundred million years you'd get enough DNA mutation to make the message unreliable, but not in a mere twenty million. It's the nearest thing to an eternal form of a message that you can imagine. Our friends who came to Earth and left the design for your stellar staircase didn't have to worry about it being obliterated by weather or accident. It would be there, as long as anyone who might get smart enough to find it was there. And the other nice thing is that you can't read the message until you're ready to use it. DNA sequence analysis needs *technology*, electricity, and computers, and matching algorithms, and scanning tunneling microscopes, before it can be performed."

"But the sequence is in every cell? A message tens of millions of digits long?"

"Every cell, in every human, in every country." Bates was picking up energy again, talking faster. "The information in DNA is tight-packed. It can define an entire human being, in a few trillionths of a gram of material. Compared with that, specifying a space-drive is nothing. But now do you see why I say it can't be kept a secret? I'm in touch with other researchers in my field, all around the world, and I know of fifty people who are moving along the same track as me. You can try as hard as you like to keep my work away from them, but it won't hold for more than a couple of years. Someone else will see the same anomalies in the sequence, and decode them independently. Then they'll have the same 'staircase to the stars' that you told Congress you wanted to provide."

Jacobsen leaned back in his seat, breathing loudly through his nose. "Damn you, Buggsie." He growled the words. "You come in here and tell me you're going to give me something. You show it to me, and then you take it right away again. If every tinpot upstart country can get to space, it makes my job *harder*, not easier."

"That depends on what you think your job is. If you believe you were put here to sit on your fat behind and make space off-limits to everyone except the US Navy, then you're right. That job won't just be hard now, it'll be impossible. That's fine with me. I never came here for that. But if you see your job as I do—as you once did—as building the system that gives everyone on Earth a stake in space development and a chance to go there, then I've done it for you. Or rather, the beings who left the design have done it for you. All I did was act as the messenger."

He reached out for the hovering cylinder, switched it off, and placed it on the desk. "Think positive, Porky. We've got the planets, and maybe we've got the stars, too, and I'm giving you a couple of years' start on the competition. With any luck, you'll be going into space *yourself* before then."

Jacobsen's hand had been moving irresistibly towards the white plastic unit. He paused. "Me!?"

"You. Who else?" Bates watched the changing expression on the other man's face. "Ah, now I'm getting to you, aren't I? And about time. You may have kidded yourself that you wanted to be head of NASA because it was a good career move. But I remember a different Porky Jacobsen. You were the one who used to bend our ears at the

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Academy, telling us how humans were meant to go to space, and how nothing would stop us. How nothing was going to stop *you*. And what you told me a few minutes ago is spot on, easy access is the key. That's what we have, now. You can go, Porky, *yourself*. You're too old for the Shuttle, but you're not too old for this. D'you hear me? You can go."

"I can." Jacobsen stared down at the cylinder, now gripped possessively in his hand. "By God, I can and I will. You know, the very idea of meeting them terrifies me—they've waited twenty million years for us. I wonder how we'll shape up. But you're right, if there's any way on earth I can get onto that prototype ship I'll be there. Nothing will stop me."

He moved the stud on the cylinder to its second setting, and watched as it rose lazily to meet the ceiling. "But there's something even scarier, in a way, than this gadget itself. It's that *they knew*, so long ago, that we humans would be the ones to make it. They knew we'd find a way, all the way, up to intelligence. And there were no humans around at that time, were there?"

"Not a one. Just primitive apes." Bates had a dreamy smile on his face. "But don't assusme that when they left that message, they knew just who'd be coming up to meet them. I said they left it *at least* twenty million years ago. How do you think I know that?"

Jacobsen shook his head. The white cylinder floated quietly down to rest on his hand.

"Because we weren't the only candidates," went on Bates. "I told you, I work with animals as well as humans. I found the same message in the DNA sequence of animals that split off the human genetic line up to twenty million years ago. We and chimps and gorillas and orangutans and gibbons separated from a common genetic line at different times, but we all have the same coded introns. Chances are the message was planted just once, maybe as a virus in a common ancestor to all of us, and that means over twenty million years ago. We were all given the message. But no one really has it until they can *read* it."

The other man looked up from his gloating over the tightly-held cylinder. "You were the one who *did* read it, Buggsie. Just you. You were the only one smart enough to do it. I want to go, but it seems to me that if anyone *deserves* to go, it's you. And I'm sure I can arrange it."

"No rush. I'll take my turn—I don't have to be on that first ship."

Jacobsen shook his head. "Don't make my mistake, Buggsie. Don't leave it until you find you're too old, and too fat, and too battered, and it's too late to go."

"Oh, I don't think that will happen." Bates hesitated. "As a matter of fact, I'm pretty confident it won't."

He rummaged in his jacket pocket, and pulled out a white, spidery structure with multiple shiny connectors. "You see, Porky, what you've got there wasn't the only thing coded into the introns. I'm not a hundred percent sure of this one, and I have to check it with the experts. But that shouldn't be hard—The National Institute on Aging is only a couple of blocks away from here, isn't it?" ■

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Frank Kelly Freas

State Of The Art

THE ART OF SCIENCE FICTION

As a practicing commercial illustrator for nearly 40 years, I have naturally developed some strong opinions on the subject of illustration in general, and science fiction in particular. Fundamental to my viewpoint is that:

1) The innate, trained, and well developed skills of the artist are the essential foundation but *only* the foundation upon which the illustrator must build.

2) The responsibility of the illustrator is to the story, not to a fashion, a theory of art, or the *presumed* demands of a market.

3) When, as sometimes happens, the aesthetic values of a given picture clash with the illustrative requirements, the latter should take precedence.

4) Illustration is a communication art, and as such requires the illustrators' grasp of all factors significant to his audience, i.e., psychology, emotional orientation, educational level, relevant symbolism, and especially an awareness of the environmental and technical elements his audience will expect him to understand.

From the above, it will be obvious that all human experience, all human emotion, and all human knowledge are an illustrator's raw materials. This, rather than specialization in a style of painting, is what determines his particular area of expertise. Science fiction, while offering the illustrator by far the greatest scope for his knowledge, his abilities, and his imagination, is at the same time the most demanding of his total application. The western illustrator, the mystery illustrator, the love story illustrator, et al, have sharply defined areas in which their knowledge

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must be accurate and exhaustive; outside that area, a smattering of general information and a bit of research is enough. The science fiction illustrator, on the other hand, *must* be adequately competent in these and any other area his story demands, and be a quick enough study to become an "expert" on radio-telescopes this week and microbiology next. He must also have the ability to forget as fast as he learns: unlike the engineer or technician, carryover from one field into the next is more likely to dilute than enhance his effectiveness. If my own memory were as good as my forgetting, I would be another John Campbell. Or, at the very least, just another ordinary Renaissance man.

The "Renaissance man" has typically been universally (and justifiably) admired. He is, perchance, not as rare as is supposed. One would probably find him practicing law; some are in industry or in business. In the by and large they typically have been much appreciated, mostly invisible, and usually rich.

The distinguishing characteristic of the modern version of the Renaissance man is not easy to spot—especially nowadays when half of them are women. It's not a position, or an occupation, or a philosophy. It's simply a mindset.

The mindset is voracious, insatiable, omnivorous and protean. Is that enough? It sure as hell describes science fiction readers. And artists. And writers. And sometimes publishers.

We always have been oddballs from the average viewpoint. Nowadays we're even odder—sometimes we look peculiar even to ourselves. Our scientific component has split into a dozen or so abstruse disciplines that can barely communicate with each other, which is bad enough; and our arts-oriented colleagues (never precisely role models for the man in the street), while tottering precariously on the form vs content tightrope, wonder seriously about themselves and *their* colleagues. But we all come together in science fiction—whatever that is.

One of my scientist friends makes the point that by and large scientists are more informed of the arts than artists are of the sciences. With the exception of those few who have discovered the space program, the majority of practicing painters and sculptors know less about the sciences than the average ten-year-old in public school. As for writers . . . well, how many authors are there cranking out juicy romance novels or glorified dime mysteries in comparison to those writing science fiction? In a culture increasingly dependent on cross-disciplinary thinking, as well as communication among and with the public, this communications gap can become a real Achilles heel.

Only in science fiction writing and illustration is there an established pattern of communication which makes any serious attempt to blend the technical, the verbal, and the visual. Mind you, I'm talking about the ideal. God knows, we can't do it every time. I am, of course, primarily concerned with science fiction illustration. As coordinating judge of the L. Ron Hubbard's Illustrators of the Future contest I travel

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to science fiction conventions all over the country—about fifteen a year—telling aspiring artists about science fiction illustration and what makes it a special and fascinating discipline.

Let's forget for the moment that the aspirant could make a better living as a plumber or a used car salesman. If *that* were important to him, he wouldn't be an artist anyway. But science fiction illustration offers more visual stimulation, a wider range of subject material, and a greater freedom to experiment than any other area of art.

One of the things I frequently point out to aspiring illustrators is the tremendous advantage to be gained from a broad education—more than just going to an art school. The illustrator does best what he knows best—and every bit of information he has in his head is something he doesn't have to take the time to look up. Research into improbable subjects is one of the major pleasures of science fiction illustration—but you have to know where to look and what questions to ask.

Enter again the renaissance mindset of the science fiction writer and science fiction illustrator, who—primarily because they are always on the hunt for new and interesting ideas—are almost invariably both generalists and synthesists; cross-disciplinary thinking is almost always their stock in trade.

Back to the budding illustrator: we assume that he (or she) has already learned to use his tools: he *can* draw, and render the drawings in a manner suitable for reproduction on the usual bathroom tissue quality paper which a lot of magazines use. The criterion for judging the success of a cover illustration is simple: Does this artwork arouse people's curiosity enough to make them want to know more; i.e., does it make the readers want to read the story—and buy the magazine to do so?

To bring about this desired effect, to inspire that kind of curiosity, it is imperative that the illustrator *read* the story (and not just once, either). He must discover its message, decide what he wants to accent, and what he can subordinate. He must establish an interesting and communicative pattern. In short, the illustrator must be able to condense thousands of written words into one potent visual image.

This is what distinguishes illustration from easel painting. Illustration is intended to communicate visually to the reader what the author says, means, or implies. This differs significantly from the "express yourself" and "do your own thing" school of art teaching so prevalent in art instruction courses over the last 50 to 60 years.

The most concise dedinition of "illustrator" came from an author friend of mine. He said that an illustrator is a tongue-tied storyteller who can't type. Another friend, a layout man, in fact, defined an illustrator as an artist who is too stupid to be an art director and too lazy to do good lettering. I, personally, prefer to define an illustrator as an artist who has developed the ability to discover and express those aspects of a subject which are impossible to express. Yes, I said "impossible."

In the commercial art field, there is an almost universal tendency to regard editorial illustration as the top of the

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heap. It isn't. It not only isn't necessarily better done than advertising illustration, it isn't even better paid. But the irresistible attraction of story illustration lies in the demand, and the opportunity, to dig into and drag out of a subject: aspects, moods, relationships, and nuances which are absolutely not expressible in words.

One problem in contemporary illustration is an outgrowth of the cultural (read "educational") emphasis on art qua *art*. Any illustrator, despite his understanding of illustrative needs, tends to design his illustration to stand alone *as a picture*. This, however successful it may be, is in direct opposition to the basic dictum which states that the complete work of art is story *plus* illustration—in that order. It is only rarely, and then *because* the appropriate illustration grasps and expresses some aspect of the story as a complete concept, that the picture fulfills both functions.

There are, of course, some pictures which capture the attention, tell a story, are aesthetically complete in themselves, and leave the viewer wanting more: that is, thinking about what he has seen.

- Michelangelo did it.
- Leonardo did it.
- Velázquez did it.
- van Gogh did it.

They were all illustrators: They were all geniuses. Perfect illustration is really quite simple. All it requires is genius.

For the rest of us, pursuit of simple adequacy in illustration is a running fight. All of the fine-tuned abilities we may have developed as artists are merely a tool box from which we hope to pick the right ones to accomplish a particular objective. Ideally, an illustration should complement the story so well that neither story nor picture is as satisfying by itself as are the two together.

An artist has a three-fold responsibility—

- to art (aesthetics)
- to himself (truth)
- to his culture (most important)

In any other place and time, he might well have been a soldier, a sailor, or—more likely—"a drawer of water and hewer of wood." This culture (whatever, whenever) has made it *possible* for him to express himself, his thoughts, his feelings, in paint or rock—and is willing to keep him eating regularly if only he will reach outside himself and express the needs, dreams, preoccupations, and visions of his culture. That is the essence of illustration.

Back in the early days of science fiction illustration it was not unusual for an editor to select one cover painting (not related to any particular story) from a portfolio of such paintings he kept on file. For each issue, the editor would then commission an author to write a story around the subject of the painting. The author would then, in turn, dig into *his* files, and recast one of his old stories that may have dated from his high school composition class days. And there you had it. But what, exactly, did you really have? If you were lucky, you may have had an illustration which related to the story—more times by accident than by design.

In some sense, things have not improved very much today. How often do you hear an author complain that his

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cover had nothing to do with his novel; or a reader complain that the cover on the book he bought had nothing to do with the story?

How could that happen? Any of several ways. Sometimes publishers or editors presume that they have a stronger sense of what "sells" than a mere illustrator (whose business, by the way, is to paint covers which sell books). I heard once of an editor who told his illustrator that he wanted a lion on the cover painting of a particular book. The illustrator asked why he should paint in a lion when there wasn't even mention of a lion in the story. The editor insisted that there was. "How do YOU know?" inquired the editor, "did you even read the story?"

"Read the story?" asked the illustrator, "I WROTE that story, and I tell you that there is not a single lion in it!"

"Well, I'll concede your point that there may be no lion in the story. But I still want a lion on the cover anyway!" The finished cover sported a lion.

Recently I happened to be in a hotel where a romance writers convention was in progress. I was invited into their dealer's room where many of the authors' books were for sale. Not a few of the writers were unhappy about their covers.

"Look at the zipper opening down the back of the heroine's dress on the cover of my book!" exclaimed one author. "A zipper? In the thirteenth century?"

"Didn't the illustrator catch that when he read the manuscript?" I inquired.

"On, no," she said, "I just wrote out a description of the details I wanted in my cover and sent it to the editor. The illustrator never saw the story." Reminds me of a game we used to play as children in which one person tells something to another, who tells another, who tells still yet another, and so forth. It was called "Telephone," and by the time the message reached the last person, it had nothing to do at all with the original message. Does it surprise anyone that there might have been a miscommunication somewhere, an interruption in the flow of information from the author to the illustrator?

Why *should* the illustrator read a whole novel, when a paragraph synopsis will give him all the data to produce an adequate cover painting? Two reasons:

1) Adequate is not enough.

2) In order to produce a simplified design, with the impact of a poster, all elements must be in perfect visual relationship of course. But to establish this relationship, the iconographic character of each element is vital. Details of the picture must, to be effective, carry a heavy burden of subconscious as well as conscious meaning to the observer. Content must be symbolic, as well as accurate for the story.

The essential task of the cover artist is to reduce fifty to one hundred thousand words to one image, to which the potential buyer will react fast enough to make him grab the book on his way to the 5:31 for Poughkeepsie. At this point, one cannot appeal to the readers' conscious mind—it's too slow. However, color, rendering, movement of line, and familiar symbols, among other things, strike directly into the prospects' unconscious, telling him instantly

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something about the story, suggesting whether or not it is to his taste, and whetting his curiosity without satisfying it.

It can be seen from the above that the necessary data to produce the desired reaction resides mostly in the subconscious of the artist. Only by being stimulated by the story, and by the writer's style, does this type of information become available as working data for the illustrator. The level and intensity of communication achieved will determine the success of the picture where it counts—in actual sales of the book.

There is, of course, a real danger that the effort to achieve impact, recognition, identity—and sales—will result in neglect of the conscious element. Quite frequently, especially in our increasingly visual culture, the reader feels cheated: the cover promised him something of interest, and didn't deliver. Or worse, it failed to "have anything to do with the story"—the commonest of all complaints.

Again, only by reading the *whole* STORY—several times, in fact—can the artist combine the necessary subliminal "push-buttons" with the factual details *relevant* to the story in a manner satisfying to both the readers' conscious and unconscious mind.

The record shows clearly that book covers (and illustrations) approached in this manner *do sell books*, and if the book doesn't sell, then publisher, writer, and artist all suffer. That is the business end of the matter. (Note: There are those who say that the cover of a book doesn't affect sales at all; these are the people who routinely publish books with covers totally unrelated to content—mere genre identification. They can switch covers at random without affecting sales at all—and obviously they must be satisfied with low but steady sales figures). However, from the cultural and personal standpoint there is an even more important function. The rare perfect marriage of illustration and story produces the final work of art—which is invariably orders of magnitude greater than either of its parts alone. Our cultural legacy would be a great deal the poorer without the Doré Bible, the Tenniel *Alice in Wonderland*, Beatrix Potter's *Tales of Peter Rabbit*, and Rackham's illustrations of *A Christmas Carol* among many others.

In short, the illustrator needs total involvement with the story. The publisher can only achieve this end by providing the artist with the complete manuscript. No condensation or excerpt can give the full flavor of the author's concept.

One thing upon which every editor, publisher, artist and writer must undeniably agree—although there is some reason to believe that the editor, the writer, and the publisher would prefer the artist not to notice it—is that:

COVERS SELL BOOKS!

Circulation managers will present reams of figures, demonstrating that this or that variation in the format, composition or subject matter will cause their newsstand sales to rise or fall by five to ten thousand copies. Publishers have told me flatly that one of my covers will sell any book they put it on—so naturally they put my covers on the books of unknown writers who need all the help they can get. Who, who do you

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suppose gets all the nasty letters from readers who want to know why *I* misled them by putting a good cover on a crummy story?!! Not, I assure you, the *publisher*.

It's common knowledge that a good cover can make a success of a mediocre book and a bad cover can kill a good one. So why are there so many bad covers on display at any given time, and why should it be so hard to select good ones? The answer is not necessarily a pleasant one, but it's fairly simple. There are, in the entire commercial art purchasing world, not more than fifty people qualified to judge the quality of the work they buy—and more important, its applicability to the subject for which it is bought. Fortunately, some of them are in science fiction. The first step in making an illustrator's art budget return a profit is to have one's science fiction art purchased by someone who knows and enjoys science fiction. The art buyer, however superb his aesthetic taste and technical judgment, must love science fiction, understand science fiction readers, and care a lot, else he'll resent having to mess with this crazy stuff. In short, he must be one of us.

All may not be lost—the generation weaned on Star Trek and matriculated on Star Wars is sprouting some fine talents, to whom science fiction and science fiction art is a natural means of expression. In the meantime, we're back to the editor, who can select artwork in his spare time. . . . Since he is already doing the work of three people, he or she won't be troubled by a little more of the same.

The advantage of having the editor select the art is multiple. For one thing, he is a little bit less likely to be aware of current art fads, so he doesn't get hung up on them. Originating a fad can be extremely profitable: following one is usually a disaster although not always recognized as the cause.

Second, since the editor is primarily verbal in his thinking, he will have less tendency to impose visual limitations on his artist. His specifications will tend, by and large, to deal with subject matter.

This brings me to another important point. Good—that is, book selling—science fiction covers have readily identifiable subjects. Regrettable as this may be, abstraction is simply not applicable to science fiction. Surrealism works fine, magic realism works better, and pure imaginative hyper-realism works best of all.

The reader *needs* a good solid anchor in a reality familiar to him, from which his imagination can soar. This is the reason that scarred and battered fighter ships, dirty space armor, construction debris in the corners of the newly energized Death Star, all had tremendous impact on the audience of Star Wars: they made the incredible *real*. This may or may not have been intentional—the plebeian or mundane mind usually assumes that it can impress simply with far out ideas.

Now it must appear that I am leaving most of the essentials which go into good cover art entirely out of consideration. How about design, composition, color, plastic values, visual impact? That's what makes a picture after all. . . .

Well, yes.

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But look: when you take your car to a mechanic, you don't—no matter how good you are at auto repairs—stand there and kibbitz, or tell him how to use his tools. When you hire a carpenter to build an extension on the nursery, you don't tell him where to drive the nails—unless you want one right between the eyes. So, you are an editor or art director. You will get the best results by doing the following simple things: *1)* Look around carefully and find an artist who is already doing (and doing consistently) the kind of picture you have in mind. *2)* When you have him or her, you *don't* try to change the illustrator around. If you want an illustration of a furry alien, you don't hire an artist who specializes in nice, shiny, hard-edged technical paintings of space ships. If you need a good astronomically accurate treatment of the landscape of Ganymede, 37 degrees North latitude, on June 17th, you don't assign the job to a portrait painter. *3)* In the event that your major stockholder's nephew *is* a portrait painter, and wants to do a science fiction cover for you, you can, of course, resign. But if you don't, then, having explained the subject matter and whatever technical data seems necessary, leave him alone to do the work. Give him his head. He might just possibly come up with something good—but whatever it is, it is not going to be improved by *your* efforts, and the boss will insist that you use it anyway. *4)* (—and finally) Assuming that you have successfully fitted together artist and assignment—*do* pay your illustrator promptly and well! You may possibly need him or her again sometime.

In the total cost of producing a good, saleable book, the percentage spent on the actual art is a minor part of the investment, but its importance to sales is greater than any other factor, with the possible exception of advertising. (Note: Distributors do *not* read books. In fact, there is some doubt whether distributors can read anything but balance sheets. Covers *also* sell distributors. Unfortunately, some of them confuse what *they* like with what the market demands: this is simply a loss you have to live with. The distributor is as close to God as we are likely to get.)

Good stories generate good reviews which sometimes generate good sales—but the critical factor in getting the book displayed and into the hands of the reader is the cover. A few extra dollars, a little extra thought spent here, will bring dividends out of all proportion to the investment.

A question has come up from time to time in the publishing business: Why go with an illustrated cover at all? Wouldn't a photograph do as well? —Photos are cheaper than artwork. Couldn't we save some money and get the same results?

To answer this question, we have to examine the concept of transmuting one sensory perception to another. "Wait a moment," you might say, "isn't the transmuting of sensory perceptions impossible?"

Certainly. Reams of official, experimental scientific, or psychological papers (a real and valid distinction) agree. So it's *still* hogwash.

Transmuting taste to vision or vice versa has been a standby of illustration

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for a hundred years. And the buyers simply stop buying if the art doesn't sell. Once corrected for inflation and market expansion—i.e., population increase times percentage of population—photography simply isn't in it with artwork. Why? Because the artist (perhaps because he is hungrier) captures an essence of the product that a photo does not. No photographic cake looks (or tastes) as good as a painted one. Sorry, fellas.

On the other hand, you would think that the glamor of high fashion clothing would be better carried by artwork than photos. Again, not so. Here, photographers do communicate the glamor—but also, to an increasingly alert buying public, they give precisely accurate information. Everyone knows that the camera never lies, even though it does so all the time. . . . Pitiful, isn't it?

Of course it's obvious that a photograph can render the texture of a surface more accurately than any artist. That should certainly dispose of the sense of touch. . . . Right?

Wrong. As any artist who has watched the reaction of his audience to a delicately sensuous nude painted over a rugged palette-knife surface knows: That ain't the texture of skin, folks! But it does bear the *mental analogue* of a physical sensation. Curious, huh?

Sight, of course, is a tool. The subject of visual manipulation has generated dozens of books, magical acts, and short cons (maybe even some long cons, depending on the talent of the grifter).

But *sound?* Who can transmute sound into sight? Well, what else *is* a sheet of music? Or an orchestral arrangement? Of course the transition/ translation/ transmutation takes place in your head—but doesn't everything? You could even cite Vachel Lindsay and his imitators—poetry can be either visual or auditory, like any good story-telling technique.

Which leaves only smell. Frankly, I wouldn't be overwhelmed by an invitation to transmute a perfume into a painting: I have no doubt I could do it, but the R&D would take considerable time and money, a substantial chunk of which I would prefer to have in hand to inspire my efforts. It would be fairly easy to turn the reader on to "wet dog," "rancid baby," or even "SKUNK," but Charlie doesn't always look like "Charlie" smells.

But anybody who can't *smell* the mildew, spoiled fruit, and rotten leather in the paintings of the old master, Ivan Albright, just isn't trying.

There seems to be a universal law which says that there is never time enough to do the research and experimentation necessary to develop the precise techniques the particular job requires. The skills, the ideas, the techniques have to be already in place—in the illustrator's head, heart, and hands.

Sometimes it actually happens. . . .

Out there in the wilds of Cleveland and Chicago and Albuquerque are hundreds of superb young artists honing their painterly skills to razor sharpness. I know: it's my job to search them out and talk them into becoming science fiction *illustrators*. And a lot of them are responding.

It's going to be a beautiful future. ■

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futures

Matthew J. Costello

Thanks to the Criterion Collection (The Voyager Company, 1351 Pacific Coast Highway, Santa Monica, CA 90401) we can see the way a classic science fiction film might have turned out. The film is *Forbidden Planet* (MGM, 1956, 98 min.) long thought to be one of the best 1950s SF films. Modeled on Shakespeare's *The Tempest*, the film is an intriguing mix of pop psychology and pulp SF. The effects were excellent for the era.

Commander Adams (played by a precomical Leslie Nielsen) and the crew of the United Planets Cruiser C-57-D come to Altair-4 to investigate the lost Bellerophon expedition. Despite warnings by the lone survivors of that expedition, Dr. Morbius (Walter Pidgeon) and his daughter, Altaira (Anne Francis), the saucer-shaped disk lands anyway, and is met by an officious Robby the Robot.

Morbius is upset at the intrusion into his perfect world but he does relent and shows Commander Adams the abandoned subterranean wonders of the Krel Laboratory and a brain-expanding device. But there is danger in this Eden—a powerful, invisible, apparently invulnerable creature that is attacking the visitors. It is, of course, the infamous monster from the id—Morbius's id—carrying out his subconscious will to protect his daughter.

Morbius eventually understands what happened to the survivors of the Bellerophon and the Krel themselves. Their machines let them create any object they could imagine. But the oddly-shaped Krel (we see the triangular doorways they used) couldn't control their nasty subsconscious, their dreams, their nightmares. They were killed by what Adams calls "The mindless beasts of the subsconscious."

The monster breaks into Morbius's ineffectual fortress and it's only when the scientist is killed that the danger ends.

Forbidden Planet is an interesting film, even if it lacks the social implications of other '50s SF. The Criterion Collection, who issued *2001: A Space Odyssey* in a digital stereo, wide-screen, laserdisc version with all sorts of extras, has given *Forbidden Planet* the same treatment.

First, the print is wonderful. Flesh tones are natural, and the print looks like it was struck yesterday. The film is presented in its original Cinemascope, wide-screen aspect—called letter-boxing. (There are black bands at the top and bottom of the screen.) On a small TV screen it can be a small image, but on any screen 20 inches or larger, the film works marvelously.

But it is the addenda that make this a must-have for your SF collection. There's the initial treatment, for the SF film called "Fatal Planet" which shows some interesting discrepancies from the finished product. There are scenes from the workprint that were cut, many of them showing how close the film came

(continued on page 207)

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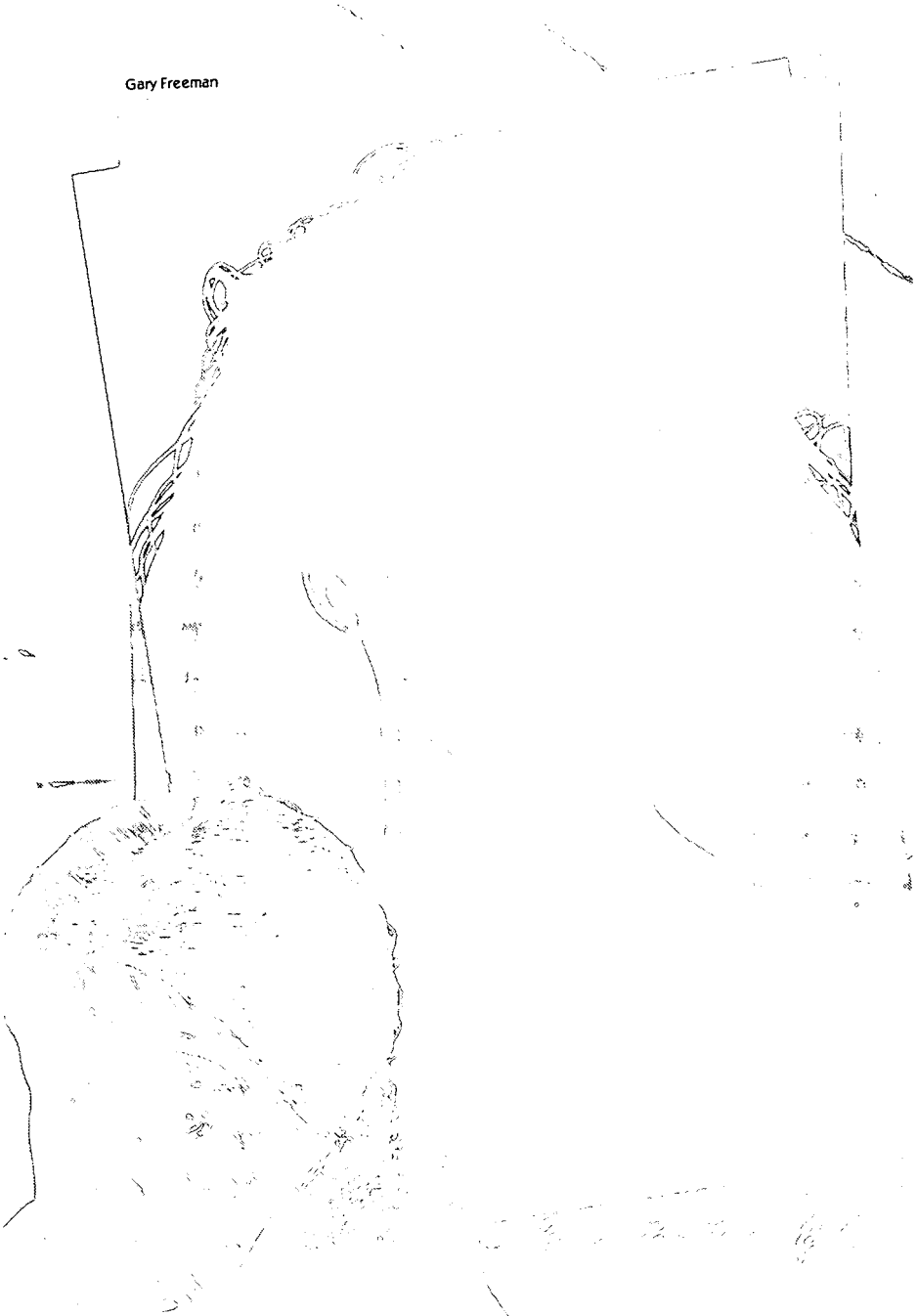

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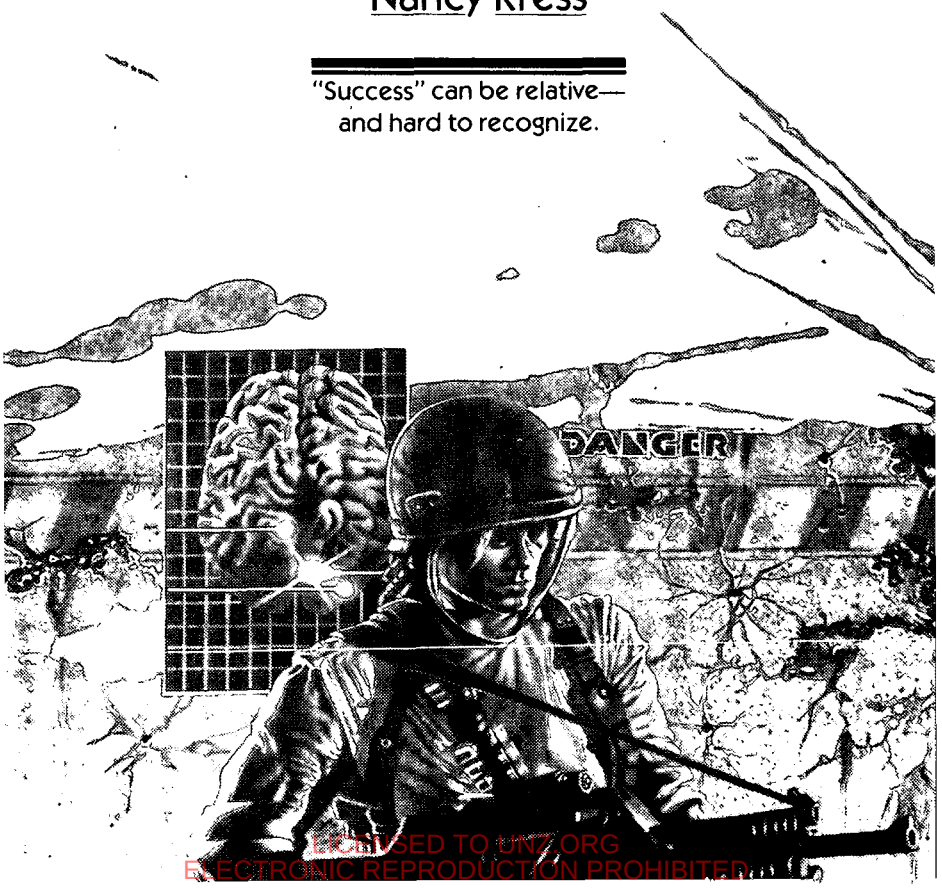
INERTIA

Nancy Kress

"Success" can be relative—
and hard to recognize.



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At dusk the back of the bedroom falls off. One minute it's a wall, exposed studs and cracked blue drywall, and the next it's snapped-off two-by-fours and an irregular fence as high as my waist, the edges both jagged and furry, as if they were covered with powder. Through the hole a sickly tree pokes upward in the narrow space between the back of our barracks and the back of a barracks in E Block. I try to get out of bed for a closer look, but today my arthritis is too bad, which is why I'm in bed in the first place. Rachel rushes into the bedroom.

"What *happened*, Gram? Are you all right?"

I nod and point. Rachel bends into the hole, her hair haloed by California twilight. The bedroom is hers, too; her mattress lies stored under my scarred four-poster.

"Termites! Damn. I didn't know we had them. You sure you're all right?"

"I'm fine. I was all the way across the room, honey. I'm fine."

"Well—we'll have to get Mom to get somebody to fix it."

I say nothing. Rachel straightens, throws me a quick glance, looks away. Still I say nothing about Mamie, but in a sudden flicker from my oil lamp I look directly at Rachel, just because she is so good to look at. Not pretty, not even here Inside, although so far the disease has affected only the left side of her face. The ridge of thickened, ropy skin, coarse as old hemp, isn't visible at all when she stands in right profile. But her nose is large, her eyebrows heavy and low, her chin a bony knob. An honest nose, expressive brows, direct gray eyes, chin that juts forward when she tilts her head in intelligent listening—to a grandmother's eye, Rachel is good to look at. They wouldn't think so, Outside. But they would be wrong.

Rachel says, "Maybe I could trade a lottery card for more drywall and nails, and patch it myself."

"The termites will still be there."

"Well, yes, but we have to do *something*." I don't contradict her. She is sixteen years old. "Feel that air coming in—you'll freeze at night this time of year. It'll be terrible for your arthritis. Come in the kitchen now, Gram—I've built up the fire."

She helps me into the kitchen, where the metal wood-burning stove throws a rosy warmth that feels good on my joints. The stove was donated to the colony a year ago by who-knows-what charity or special interest group for, I suppose, whatever tax breaks still hold for that sort of thing. If any do. Rachel tells me that we still get newspapers, and once or twice I've wrapped vegetables from our patch in some fairly new-looking ones. She even says that the young Stevenson boy works a donated computer news net in the Block J community hall, but I no longer follow Outside tax regulations. Nor do I ask why Mamie was the one to get the wood-burning stove when it wasn't a lottery month.

The light from the stove is stronger than the oil flame in the bedroom; I see that beneath her concern for our dead bedroom wall, Rachel's face is flushed with excitement. Her young skin glows right from intelligent chin to the ropy ridge of disease, which of course never changes color. I smile at her. Sixteen is so easy to excite. A new hair ribbon

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from the donations repository, a glance from a boy, a secret with her cousin Jennie.

"Gram," she says, kneeling beside my chair, her hands restless on the battered wooden arm, "Gram—there's a visitor. From Outside. Jennie *saw* him."

I go on smiling. Rachel—nor Jennie, either—can't remember when disease colonies had lots of visitors. First bulky figures in contamination suits, then a few years later, sleeker figures in the sani-suits that took their place. People were still being interred from Outside, and for years the checkpoints at the Rim had traffic flowing both ways. But of course Rachel doesn't remember all that; she wasn't born. Mamie was only twelve when we were interred here. To Rachel, a visitor might well be a great event. I put out one hand and stroke her hair.

"Jennie said he wants to talk to the oldest people in the colony, the ones who were brought here with the disease. Hal Stevenson told her."

"Did he, sweetheart?" Her hair is soft and silky. Mamie's hair had been the same at Rachel's age.

"He might want to talk to you!"

"Well, here I am."

"But aren't you excited? What do you suppose he wants?"

I'm saved from answering her because Mamie comes in, her boyfriend Peter Malone following with a string-bag of groceries from the repository.

At the first sound of the doorknob turning, Rachel gets up from beside my chair and pokes at the fire. Her face goes completely blank, although I know that part is only temporary. Mamie cries, "Here we are!" in her high, doll-baby voice, cold air from the hall swirling around her like bright water. "Mama darling—how are you feeling? And Rachel! You'll never guess—Pete had extra depository cards and he got us some chicken! I'm going to make a stew!"

"The back wall fell off the bedroom," Rachel says flatly. She doesn't look at Peter with his string-crossed chicken, but I do. He grins his patient, wolfish grin. I guess that he won the depository cards at poker. His fingernails are dirty. The part of the newspaper I can see says ESIDENT CONFISCATES C.

Mamie says, "What do you mean, fell off?"

Rachel shrugs. "Just fell off. Termites."

Mamie looks helplessly at Peter, whose grin widens. I can see how it will be: They will have a scene later, not completely for our benefit, although it will take place in the kitchen for us to watch. Mamie will beg prettily for Peter to fix the wall. He will demur, grinning. She will offer various smirking hints about barter, each hint becoming more explicit. He will agree to fix the wall. Rachel and I, having no other warm room to go to, will watch the fire or the floor or our shoes until Mamie and Peter retire ostentatiously to her room. It's the ostentation that embarrasses us. Mamie has always needed witnesses to her desirability.

But Peter is watching Rachel, not Mamie. "The chicken isn't from Outside, Rachel. It's from that chicken yard in Block B. I heard you say how clean they are."

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"Yeah," Rachel says shortly, gracelessly.

Mamie rolls her eyes. "Say 'thank you,' darling. Pete went to a lot of trouble to get this chicken."

"Thanks."

"Can't you say it like you *mean* it?" Mamie's voice goes shrill.

"*Thanks*," Rachel says. She heads towards our three-walled bedroom. Peter, still watching her closely, shifts the chicken from one hand to the other. The pressure of the string bag cuts lines across the chicken's yellowish skin.

"Rachel Anne Wilson—"

"Let her go," Peter says softly.

"*No*," Mamie says. Between the five crisscrossing lines of disease, her face sets in unlovely lines. "She can at least learn some manners. And I want her to hear our announcement! Rachel, you just come right back out here this minute!"

Rachel returns from the bedroom; I've never known her to disobey her mother. She pauses by the open bedroom door, waiting. Two empty candle sconces, both blackened by old smoke, frame her head. It has been since at least last winter that we've had candles for them. Mamie, her forehead creased in irritation, smiles brightly.

"This is a special dinner, all of you. Pete and I have an announcement. We're going to get married."

"That's right," Peter says. "Congratulate us."

Rachel, already motionless, somehow goes even stiller. Peter watches her carefully. Mamie casts down her eyes, blushing, and I feel a stab of impatient pity for my daughter, propping up mid-thirties girlishness on such a slender reed as Peter Malone. I stare at him hard. If he ever touches Rachel . . . but I don't really think he would. Things like that don't happen anymore. Not Inside.

"Congratulations," Rachel mumbles. She crosses the room and embraces her mother, who hugs her back with theatrical fervor. In another minute, Mamie will start to cry. Over her shoulder I glimpse Rachel's face, momentarily sorrowing and loving, and I drop my eyes.

"Well! This calls for a toast!" Mamie cries gaily. She winks, makes a clumsy pirouette, and pulls a bottle from the back shelf of the cupboard Rachel got at the last donations lottery. The cupboard looks strange in our kitchen: gleaming white lacquer, vaguely oriental-looking, amid the wobbly chairs and scarred table with the broken drawer no one has ever gotten around to mending. Mamie flourishes the bottle, which I didn't know was there. It's champagne.

What had they been thinking, the Outsiders who donated champagne to a disease colony? *Poor devils, even if they never have anything to celebrate. . . .* Or *Here's something they won't know what to do with. . . .* Or *Better them than me—as long as the sickies stay Inside. . . .* It doesn't really matter.

"I just love champagne!" Mamie cries feverishly; I think she has drunk it once. "And oh look—here's someone else to help us celebrate! Come in, Jennie—come in and have some champagne!"

Jennie comes in, smiling. I see the same eager excitement that animated

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Rachel before her mother's announcement. It glows on Jennie's face, which is beautiful. She has no disease on her hands or her face. She must have it somewhere, she was born Inside, but one doesn't ask that. Probably Rachel knows. The two girls are inseparable. Jennie, the daughter of Mamie's dead husband's brother, is Rachel's cousin, and technically Mamie is her guardian. But no one pays attention to such things anymore, and Jennie lives with some people in a barracks in the next Block, although Rachel and I asked her to live here. She shook her head, the beautiful hair so blonde it's almost white bouncing on her shoulders, and blushed in embarrassment, painfully not looking at Mamie.

"I'm getting married, Jennie," Mamie says, again casting down her eyes bashfully. I wonder what she did, and with whom, to get the champagne.

"Congratulations!" Jennie says warmly. "You, too, Peter."

"Call me Pete," he says, as he has said before. I catch his hungry look at Jennie. She doesn't, but some sixth sense—even here, even Inside—makes her step slightly backwards. I know she will go on calling him "Peter."

Mamie says to Jennie, "Have some more champagne. Stay for dinner."

With her eyes Jennie measures the amount of champagne in the bottle, the size of the chicken bleeding slightly on the table. She measures unobtrusively, and then of course she lies. "I'm sorry, I can't—we ate our meal at noon today. I just wanted to ask if I could bring someone over to see you later, Gram. A visitor." Her voice drops to a hush, and the glow is back. "From *Outside*."

I look at her sparkling blue eyes, at Rachel's face, and I don't have the heart to refuse. Even though I can guess, as the two girls cannot, how the visit will be. I am not Jennie's grandmother, but she has called me that since she was three. "All right."

"Oh, thank you!" Jennie cries, and she and Rachel look at each other with delight. "I'm so glad you said yes, or else we might never get to talk to a visitor up close at all!"

"You're welcome," I say. They are so young. Mamie looks petulant; her announcement has been upstaged. Peter watches Jennie as she impulsively hugs Rachel. Suddenly I know that he, too, is wondering where Jennie's body is diseased, and how much. He catches my eye and looked at the floor, his dark eyes lidded, half ashamed. But only half. A log crackles in the wooden stove, and for a brief moment the fire flares.

The next afternoon Jennie brings the visitor. He surprises me immediately: he isn't wearing a sani-suit, and he isn't a sociologist.

In the years following the internments, the disease colonies had a lot of visitors. Doctors still hopeful of a cure for the thick gray ridges of skin that spread slowly over a human body—or didn't, nobody knew why. Disfiguring. Ugly. Maybe eventually fatal. And *communicable*. That was the biggie: communicable. So doctors in sani-suits came looking for causes or cures. Journalists in sani-suits came looking for stories with four-color photo spreads. Legislative fact-finding committees in sani-suits came looking for facts, at least

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until Congress took away the power of colonies to vote, pressured by taxpayers who, increasingly pressured themselves, resented our dollar-dependent status. And the sociologists came in droves, minicams in hand, ready to record the collapse of the ill-organized and ill colonies into street-gang, dog-eat-dog anarchy.

Later, when this did not happen, different sociologists came in later-model sani-suits to record the reasons why the colonies were not collapsing on schedule. All these groups went away dissatisfied. There was no cure, no cause, no story, no collapse. No reasons.

The sociologists hung on longer than anybody else. Journalists have to be timely and interesting, but sociologists merely have to publish. Besides, everything in their cultural tradition told them that Inside *must* sooner or later degenerate into war zones: Deprive people of electricity (power became expensive), of municipal police (who refused to go Inside), of freedom to leave, of political clout, of jobs, of freeways and movie theaters and federal judges and state-administered elementary-school accreditation—and you get unrestrained violence to just survive. Everything in the culture said so. Bombed-out inner cities. *Lord Of The Flies*. The Chicago projects. Western movies. Prison memoirs. The Bronx. East L.A. Thomas Hobbes. The sociologists *knew*.

Only it didn't happen.

The sociologists waited. And Inside we learned to grow vegetables and raise chickens who, we learned, will eat anything. Those of us with computer knowledge worked real jobs over modems for a few years—maybe it was as long as a decade—before the equipment became too obsolete and unreplaced. Those who had been teachers organized classes among the children, although the curriculum, I think, must have gotten simpler every year: Rachel and Jennie don't seem to have much knowledge of history or science. Doctors practiced with medicines donated by corporations for the tax write-offs, and after a decade or so they began to train apprentices. For a while—it might have been a long while—we listened to radios and watched TV. Maybe some people still do, if we have any working ones donated from Outside. I don't pay attention.

Eventually the sociologists remembered older models of deprivation and discrimination and isolation from the larger culture: Jewish shtetls. French Huguenots. Amish farmers. Self-sufficient models, stagnant but uncollapsed. And while they were remembering, we held goods lotteries, and took on apprentices, and rationed depository food according to who needed it, and replaced our broken-down furniture with other broken-down furniture, and got married and bore children. We paid no taxes, fought no wars, wielded no votes, provided no drama. After a while—a long while—the visitors stopped coming. Even the sociologists.

But here stands this young man, without a sani-suit, smiling from brown eyes under thick dark hair and taking my hand. He doesn't wince when he touches the ropes of disease. Nor does he appear to be cataloguing the kitchen furniture for later recording: three chairs, one donated imitation Queen Anne and one Inside genuine Joe Kleinschmidt; the table; the wood stove; the sparkling new

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oriental lacquered cupboard; plastic sink with hand pump: woodbox with donated wood stamped "Gift of Boise-Cascade"; two eager and intelligent and loving young girls he had better not try to patronize as diseased freaks. It has been a long time, but I remember.

"Hello, Mrs. Pratt. I'm Tom McHabe. Thank you for agreeing to talk to me."

I nod. "What are we going to talk about, Mr. McHabe? Are you a journalist?"

"No. I'm a doctor."

I don't expect that. Nor do I expect the sudden strain that flashes across his face before it's lost in another smile. Although it is natural enough that strain should be there: Having come Inside, of course, he can never leave. I wonder where he picked up the disease. No other new cases have been admitted to our colony for as long as I can remember. Had they been taken, for some Outside political reason, to one of the other colonies instead?

McHabe says, "I don't have the disease, Mrs. Pratt."

"Then why on earth—"

"I'm writing a paper on the progress of the disease in long-established colony residents. I had to do that from Inside, of course," he says, and immediately I know he is lying. Rachel and Jennie, of course, do not. They sit one on each side of him like eager birds, listening.

"And how will you get this paper out once it's written?" I say.

"Short-wave radio. Colleagues are expecting it," but he doesn't quite meet my eyes.

"And this paper is worth permanent internment?"

"How rapidly did your case of the disease progress?" he says, not answering my question. He looks at my face and hands and forearms, an objective and professional scrutiny that makes me decide at least one part of his story is true. He is a doctor.

"Any pain in the infected areas?"

"None."

"Any functional disability or decreased activity as a result of the disease?" Rachel and Jennie look slightly puzzled; he's testing me to see if I understand the terminology.

"None."

"Any change in appearance over the last few years in the first skin areas to be affected? Changes in color or tissue density or size of the thickened ridges?"

"None."

"Any other kinds of changes I haven't thought to mention?"

"None."

He nods and rocks back on his heels. He's cool, for someone who is going to develop non-dysfunctional ropes of disease himself. I wait to see if he's going to tell me why he's really here. The silence lengthens. Finally McHabe says, "You were a CPA," at the same time that Rachel says, "Anyone want a glass of 'ade?"

McHabe accepts gladly. The two girls, relieved to be in motion, busy themselves pumping cold water, crushing canned peaches, mixing the 'ade in a brown plastic pitcher with a deep wart on one side where it once touched the hot stove.

"Yes," I say to McHabe, "I was a CPA. What about it?"

"They're outlawed now."

"CPA's? Why? Staunch pillars of the

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establishment," I say, and realize how long it's been since I used words like that. They taste metallic, like old tin.

"Not any more. IRS does all tax computations and sends every household a customized bill. The calculations on how they reach your particular customized figure are classified. To prevent foreign enemies from guessing at revenue available for defense."

"Ah."

"My uncle was a CPA."

"What is he now?"

"Not a CPA," McHabe says. He doesn't smile. Jennie hands glasses of 'ade to me and then to McHabe, and then he does smile. Jennie drops her lashes and a little color steals into her cheeks. Something moves behind McHabe's eyes. But it's not like Peter; not at all like Peter.

I glance at Rachel. She doesn't seem to have noticed anything. She isn't jealous, or worried, or hurt. I relax a little.

McHabe says to me, "You also published some magazine articles popularizing history."

"How do you happen to know that?"

Again he doesn't answer me. "It's an unusual combination of abilities, accounting and history writing."

"I suppose so," I say, without interest. It was so long ago.

Rachel says to McHabe, "Can I ask you something?"

"Sure."

"Outside, do you have medicines that will cure wood of termites?"

Her face is deadly serious. McHabe doesn't grin, and I admit— reluctantly —that he is likable. He answers her courteously. "We don't cure the wood, we do away with the termites. The best way is to build with wood saturated with creosote, a chemical they don't like, so that they don't get into the wood in the first place. But there must be chemicals that will kill them after they're already there. I'll ask around and try to bring you something on my next trip Inside."

His next trip Inside. He drops this bombshell as if easy passage In and Out were a given. Rachel's and Jennie's eyes grow wide; they both look at me. McHabe does, too, and I see that his look is a cool scrutiny, an appraisal of my reaction. He expects me to ask for details, or maybe even—it's been a long time since I thought in these terms, and it's an effort—to become angry at him for lying. But I don't know whether or not he's lying, and at any rate, what does it matter? A few people from Outside coming into the colony—how could it affect us? There won't be large immigration, and no emigration at all.

I say quietly, "Why are you really here, Dr. McHabe?"

"I told you, Mrs. Pratt. To measure the progress of the disease." I say nothing. He adds, "Maybe you'd like to hear more about how it is now Outside."

"Not especially."

"Why not?"

I shrug. "They leave us alone."

He weighs me with his eyes. Jennie says timidly, "I'd like to hear more about Outside." Before Rachel can add "Me, too," the door flings violently open and Mamie backs into the room, screaming into the hall behind her.

"And don't ever come back! If you think I'd ever let you touch me again after screwing that . . . that . . . I hope she's got a diseased twat and you get

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it on your—'' She sees McHabe and breaks off, her whole body jerking in rage. A soft answer from the hall, the words unintelligible from my chair by the fire, makes her gasp and turn even redder. She slams the door, bursts into tears, and runs into her bedroom, slamming that door as well.

Rachel stands up. ''Let me, honey,'' I say, but before I can rise—my arthritis is much better—Rachel disappears into her mother's room. The kitchen rings with embarrassed silence.

Tom McHabe rises to leave. ''Sit down, Doctor,'' I say, hoping, I think, that if he remains Mamie will restrain her hysterics—maybe—and Rachel will emerge sooner from her mother's room.

McHabe looks undecided. Then Jennie says, ''Yes, please stay. And would you tell us—'' I see her awkwardness, her desire to not sound stupid ''—about how people do Outside?''

He does. Looking at Jennie but meaning me, he talks about the latest version of martial law, about the failure of the National Guard to control protestors against the South American war until they actually reached the edge of the White House electro-wired zone; about the growing power of the Fundamentalist underground that the other undergrounds—he uses the plural—call ''the God gang.'' He tells us about the industries losing out steadily to Korean and Chinese competitors, the leaping unemployment rate, the ethnic backlash, the cities in flames. Miami, New York, Los Angeles—these had been rioting for years. Now it's Portland, St. Louis, Eugene, Phoenix. Grand Rapids burning. It's hard to picture.

I say, ''As far as I can tell, donations to our repositories haven't fallen off.''

He looks at me again with that shrewd scrutiny, weighing something I can't see, then touches the edge of the stove with one boot. The boot, I notice, is almost as old and scarred as one of ours. ''Korean-made stove. They make nearly all the donations now. Public relations. Even a lot of martial-law congressman had relatives interred, although they won't admit it now. The Asians cut deals warding off complete protectionism, although of course your donations are only a small part of that. But just about everything you get Inside is Chink or Splat.'' He uses the words casually, this courteous young man giving me the news from such a liberal slant, and that tells me more about the Outside than all his bulletins and summaries.

Jennie says haltingly, ''I saw . . . I think it was an Asian man. Yesterday.''

''Where?'' I say sharply. Very few Asian-Americans contract the disease; something else no one understands. There are none in our colony.

''At the Rim. One of the guards. Two other men were kicking him and yelling names at him—we couldn't hear too clearly over the intercom boxes.''

''We? You and Rachel? What were you two doing at the *Rim*?'' I say, and hear my own tone. The rim, a wide empty strip of land, is electro-mined and barb-wired to keep us communicables Inside. The Rim is surrounded by miles of defoliated and disinfected land, poisoned by preventive chemicals, but even so it's patrolled by unwilling soldiers who communicate with the Inside by intercoms set up every half mile on both sides of the barbed wire. When the col-

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ony used to have a fight or a rape or—once, in the early years—a murder, it happened on the Rim. When the hateful and the hating came to hurt us, because before the electro-wiring and barbed wire we were easy targets and no police would follow them Inside, the soldiers, and sometimes our men as well, stopped them at the Rim. Our dead are buried near the Rim. And Rachel and Jennie, dear gods, at the *Rim*. . . .

"We went to ask the guards over the intercom boxes if they knew how to stop termites," Jennie says logically. "After all, their work is to stop things, germs and things. We thought they might be able to tell us how to stop termites. We thought they might have special training in it."

The bedroom door opens and Rachel comes out, her young face drawn. McHabe smiles at her, and then his gaze returns to Jennie. "I don't think soldiers are trained in stopping termites, but I'll definitely bring you something to do that the next time I come Inside."

There it is again. But all Rachel says is, "Oh, good. I asked around for more drywall today, but even if I get some, the same thing will happen again if we don't get something to stop them."

McHabe says, "Did you know that termites elect a queen? Closely-monitored balloting system. Fact."

Rachel smiles, although I don't think she really understands.

"And ants can bring down a rubber tree plant." He begins to sing, an old song from my childhood. "High Hopes." Frank Sinatra on the stereo—before CDs, even, before a lot of things—iced tea and Coke in tall glasses on a Sunday afternoon, aunts and uncles sitting around the kitchen, football on television in the living room beside a table with a lead-crystal vase of the last purple chrysanthemums from the garden. The smell of late Sunday afternoon, tangy but a little thin, the last of the weekend before the big yellow school bus labored by on Monday morning.

Jennnie and Rachel, of course, see none of this. They hear light-hearted words in a good baritone and a simple rhythm they can follow, hope and courage in silly doggerel. They are delighted. They join in the chorus after McHabe has sung it a few times, then sing him three songs popular at Block dances, then make him more 'ade, then begin to ask questions about the Outside. Simple questions: What do people eat? Where do they get it? What do they wear? The three of them are still at it when I go to bed, my arthritis finally starting to ache, glancing at Mamie's closed door with a sadness I hadn't expected and can't name.

"That son-of-a-bitch better never come near me again," Mamie says the next morning. The day is sunny and I sit by our one window, knitting a blanket to loosen my fingers, wondering if the donated wool came from Chinese or Korean sheep. Rachel has gone with Jennie on a labor call to deepen a well in Block E; people had been talking about doing that for weeks, and apparently someone finally got around to organizing it. Mamie slumps at the table, her eyes red from crying. "I caught him screwing Mary Delbarton." Her voice splinters like a two-year-old's. "Mama—he was screwing Mary Delbarton."

"Let him go, Mamie."

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"I'd be alone again." She says it with a certain dignity, which doesn't last. "That son-of-a-bitch goes off with that slut one day after we're engaged and I'm fucking alone again!"

I don't say anything; there isn't anything to say. Mamie's husband died eleven years ago, when Rachel was only five, of an experimental cure being tested by government doctors. The colonies were guinea pigs. Seventeen people in four colonies died, and the government discontinued funding and made it a crime for anyone to go in and out of a disease colony. Too great a risk of contamination, they said. For the protection of the citizens of the country.

"He'll never touch me again!" Mamie says, tears on her lashes. One slips down an inch until it hits the first of the disease ropes, then travels sideways towards her mouth. I reach over and wipe it away. "Goddamn fucking son-of-a-bitch!"

By evening, she and Peter are holding hands. They sit side by side, and his fingers creep up her thigh under what they think is the cover of the table. Mamie slips her hand under his buttocks. Rachel and Jennie look away, Jennie flushing slightly. I have a brief flash of memory, of the kind I haven't had for years: myself at eighteen or so, my first year at Yale, in a huge brass bed with a modern geometric-print bedspread and a red-headed man I met three hours ago. But here, Inside . . . here sex, like everything else, moves so much more slowly, so much more carefully, so much more privately. For such a long time people were afraid that this disease, like that other earlier one, might be transmitted sexually. And then there was the shame of one's ugly body, crisscrossed with ropes of disease . . . I'm not sure that Rachel has ever seen a man naked.

I say, for the sake of saying something, "So there's a Block dance Wednesday."

"Block B," Jennie says. Her blue eyes sparkle. "With the band that played last summer for Block E."

"Guitars?"

"Oh, no! They've got a trumpet *and* a violin," Rachel says, clearly impressed. "You should hear how they sound together, Gram—it's a lot different than guitars. Come to the dance!"

"I don't think so, honey. Is Dr. McHabe going?" From both their faces I know this guess is right.

Jennie says hesitantly, "He wants to talk to you first, before the dance, for a few minutes. If that's all right."

"Why?"

"I'm not . . . not exactly sure I know all of it." She doesn't meet my eyes: unwilling to tell me, unwilling to lie. Most of the children Inside, I realize for the first time, are not liars. Or else they're bad ones. They're good at privacy, but it must be an honest privacy.

"Will you see him?" Rachel says eagerly.

"I'll see him."

Mamie looks away from Peter long enough to add sharply, "If it's anything about you or Jennie, he should see *me*, miss, not your grandmother. I'm your mother and Jennie's guardian, and don't you forget it."

"No, Mama," Rachel says.

"I don't like your tone, miss!"

"Sorry," Rachel says, in the same tone. Jennie drops her eyes, embar-

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rassed. But before Mamie can get really started on indignant maternal neglect, Peter whispers something in her ear and she claps her hand over her mouth, giggling.

Later, when just the two of us are left in the kitchen, I say quietly to Rachel, "Try not to upset your mother, honey. She can't help it."

"Yes, Gram," Rachel says obediently. But I hear the disbelief in her tone, a disbelief muted by her love for me and even for her mother, but nonetheless there. Rachel doesn't believe that Mamie can't help it. Rachel, born Inside, can't possibly help her own ignorance of what it is that Mamie thinks she has lost.

On his second visit to me six days later, just before the Block dance, Tom McHabe seems different. I'd forgotten that there are people who radiate such energy and purpose that they seem to set the very air tingling. He stands with his legs braced slightly apart, flanked by Rachel and Jennie, both dressed in their other skirts for the dance. Jennie has woven a red ribbon through her blonde curls; it glows like a flower. McHabe touches her lightly on the shoulder, and I realize from her answering look what must be happening between them. My throat tightens.

"I want to be honest with you, Mrs. Pratt. I've talked to Jack Stevenson and Mary Kramer, as well as some others in Blocks C and E, and I've gotten a feel for how you live here. A little bit, anyway. I'm going to tell Mr. Stevenson and Mrs. Kramer what I tell you, but I wanted you to be first."

"Why?" I say, more harshly than I intend. Or think I intend.

He isn't fazed. "Because you're one of the oldest survivors of the disease. Because you had a strong education Outside. Because your daughter's husband died of axoperidine."

At the same moment that I realize what McHabe is going to say next, I realize, too, that Rachel and Jennie have already heard it. They listen to him with the slightly-open-mouthed intensity of children hearing a marvelous but familiar tale. But do they understand? Rachel wasn't present when her father finally died, gasping for air his lungs couldn't use.

McHabe, watching me, says, "There's been a lot of research on the disease since those deaths, Mrs. Pratt."

"No. There hasn't. Too risky, your government said."

I see that he caught the pronoun. "Actual administration of any cures is illegal, yes. To minimize contact with communicables."

"So how has this 'research' been carried on?"

"By doctors willing to go Inside and not come out again. Data is transmitted out by laser. In code."

"What clean doctor would be willing to go Inside and not come out again?"

McHabe smiles; again I'm struck by that quality of spontaneous energy. "Oh, you'd be surprised. We had three doctors inside the Pennsylvania colony. One past retirement age. Another, an old-style Catholic, who dedicated his research to God. A third nobody could figure out, a dour persistent guy who was a brilliant researcher."

Was. "And you."

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"No," McHabe says quietly. "I go in and out."

"What happened to the others?"

"They're dead." He makes a brief aborted movement with his right hand and I realized that he is, or was, a smoker. How long since I had reached like that for a non-existent cigarette? Nearly two decades. Cigarettes are not among the things people donate; they're too valuable. Yet I recognize the movement still. "Two of the three doctors caught the disease. They worked on themselves as well as volunteers. Then one day the government intercepted the relayed data and went in and destroyed everything."

"Why?" Jennie asks.

"Research on the disease is illegal. Everyone Outside is afraid of a leak: a virus somehow getting out on a mosquito, a bird, even as a spore."

"Nothing has gotten out in all these years," Rachel says.

"No. But the government is afraid that if researchers start splicing and intercutting genes, it could make viruses more viable. You don't understand the Outside, Rachel. *Everything* is illegal. This is the most repressive period in American history. Everyone's afraid."

"You're not," Jennie says, so softly I barely hear her. McHabe gives her a smile that twists my heart.

"Some of us haven't given up. Research goes on. But it's all underground, all theoretical. And we've learned a lot. We've learned that the virus doesn't just affect the skin. There are—"

"Be quiet," I say, because I see that he's about to say something important. "Be quiet a minute. Let me think."

McHabe waits. Jennie and Rachel look at me, that glow of suppressed excitement on them both. Eventually I find it. "You want something, Dr. McHabe. All this research wants something from us besides pure scientific joy. With things Outside as bad as you say, there must be plenty of diseases Outside you could research without killing yourself, plenty of need among your own people—" he nods, his eyes gleaming "—but you're here. Inside. Why? We don't have any more new or interesting symptoms, we barely survive, the Outside stopped caring what happened to us a long time ago. We have *nothing*. So why are you here?"

"You're wrong, Mrs. Pratt. You do have something interesting going on here. You *have* survived. Your society has regressed, but not collapsed. You're functioning under conditions where you shouldn't have."

The same old crap. I raise my eyebrows at him. He stares into the fire and says quietly, "To say Washington is rioting says nothing. You have to see a twelve-year-old hurl a homemade bomb, a man sliced open from neck to crotch because he still had a job to go to and his neighbor doesn't, a three-year-old left to starve because someone abandoned her like an unwanted kitten. . . . You don't know. It doesn't happen Inside."

"We're better than they are," Rachel says. I look at my grandchild. She says it simply, without self-aggrandizement, but with a kind of wonder. In the firelight the thickened gray ropes of skin across her cheek glow dull maroon.

McHabe says, "Perhaps you are. I started to say earlier that we've learned that the virus doesn't affect just the skin.

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It alters neurotransmitter receptor sites in the brain as well. It's a relatively slow transformation, which is why the flurry of research in the early years of the disease missed it. But it's real, as real as the faster site-capacity transformations brought about by, say, cocaine. Are you following me, Mrs. Pratt?"

I nod. Jennie and Rachel don't look lost, although they don't know any of this vocabulary, and I realize that McHabe must have explained all this to them, earlier, in some other terms.

"As the disease progresses to the brain, the receptors which receive excitory transmitters slowly become harder to engage, and the receptors which receive inhibiting transmitters become easier to engage."

"You mean that we become stupider."

"Oh, no! Intelligence is not affected at all. The results are emotional and behavioral, not intellectual. You become—all of you—calmer. Disinclined to action or innovation. Mildly but definitely depressed."

The fire burns down. I pick up the poker, bent slightly where someone once tried to use it as a crowbar, and poke at the log, which is a perfectly shaped molded-pulp synthetic stamped "Donated by Weyerhauser-Seyyed."

"I don't feel depressed, young man."

"It's a depression of the nervous system, but a new kind—without the hopelessness usually associated with clinical depression."

"I don't believe you."

"Really? With all due courtesy, when was the last time you—or any of the older Block leaders—pushed for any significant change in how you do things Inside?"

"Sometimes things cannot be constructively changed. Only accepted. That's not chemistry, it's reality."

"Not Outside," McHabe says grimly. "Outside they don't change constructively *or* accept. They get violent. Inside, you've had almost no violence since the early years, even when your resources tightened again and again. When was the last time you tasted butter, Mrs. Pratt, or smoked a cigarette, or had a new pair of jeans? Do you know what happens Outside when consumer goods become unavailable and there are no police in a given area? But Inside you just distribute whatever you have as fairly as you can, or make do without. No looting, no rioting, no cancerous envy. No one Outside knew *why*. Now we do."

"We have envy."

"But it doesn't erupt into anger."

Each time one of us speaks, Jennie and Rachel turn their heads to watch, like rapt spectators at tennis. Which neither of them has ever seen. Jennie's skin glows like pearl.

"Our young people aren't violent either, and the disease hasn't advanced very far in some of them."

"They learn how to behave from their elders—just like kids everywhere else."

"I don't feel depressed."

"Do you feel energetic?"

"I have arthritis."

"That's not what I mean."

"What do you mean, Doctor?"

Again that restless furtive reach for a nonexistent cigarette. But his voice is quiet. "How long did it take you to get around to applying that insecticide I got Rachel for the termites? She told me you forbade her to do it, and I think you

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were right; it's dangerous stuff. How many days went by before you or your daughter spread it around?"

The chemical is still in its can.

"How much anger are you feeling now, Mrs. Pratt?" he goes on. "Because I think we understand each other, you and I, and that you guess now why I'm here. But you aren't shouting or ordering me out of here or even telling me what you think of me. You're listening, and you're doing it calmly, and you're accepting what I tell you even though you know what I want you to—"

The door opens and he breaks off. Mamie flounces in, followed by Peter. She scowls and stamps her foot. "Where were you, Rachel? We've been standing outside waiting for you all for ten minutes now! The dance has already started!"

"A few more minutes, Mama. We're talking."

"Talking? About what? What's going on?"

"Nothing," McHabe says. "I was just asking your mother some questions about life Inside. I'm sorry we took so long."

"You never ask *me* questions about life Inside. And besides, I want to dance!"

McHabe says, "If you and Peter want to go ahead, I'll bring Rachel and Jennie."

Mamie chews her bottom lip. I suddenly know that she wants to walk up the street to the dance between Peter and McHabe, an arm linked with each, the girls trailing behind. McHabe meets her eyes steadily.

"Well, if that's what you *want*," she says pettishly. "Come on, Pete!" She closes the door hard.

I look at McHabe, unwilling to voice the question in front of Rachel, trusting him to know the argument I want to make. He does. "In clinical depression, there's always been a small percentage for whom the illness is manifested not as passivity, but as irritability. It may be the same. We don't know."

"Gram," Rachel says, as if she can't contain herself any longer, "he has a *cure*."

"For the skin manifestation only," McHabe says quickly, and I see that he wouldn't have chosen to blurt it out that way. "*Not* for the effects on the brain."

I say, despite myself, "How can you cure one without the other?"

He runs his hand through his hair. Thick, brown hair. I watch Jennie watch his hand. "Skin tissue and brain tissue aren't alike, Mrs. Pratt. The virus reaches both the skin and the brain at the same time, but the changes to brain tissue, which is much more complex, take much longer to detect. And they can't be reversed—nerve tissue is non-regenerative. If you cut your fingertip, it will eventually break down and replace the damaged cells to heal itself. Shit, if you're young enough, you can grow an entire new fingertip. Something like that is what we think our cure will stimulate the skin to do.

"But if you damage your cortex, those cells are gone forever. And unless another part of the brain can learn to compensate, whatever behavior those cells governed is also changed forever."

"Changed into depression, you mean."

"Into calmness. Into restraint of action . . . The country desperately needs restraint, Mrs. Pratt."

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"And so you want to take some of us Outside, cure the skin ropes, and let the 'depression' spread: the 'restraint,' the 'slowness to act. . . . "

"We have enough action out there. And no one can control it—it's all the wrong kind. What we need now is to slow everything down a little—before there's nothing left to slow down."

"You'd infect a whole population—"

"Slowly. Gently. For their own good—"

"Is that up to *you* to decide?"

"Considering the alternative, yes. Because it *works*. The colonies work, despite all your deprivations. And they work because of the disease!"

"Each new case would have skin ropes—"

"Which we'll then cure."

"Does your *cure* work, Doctor? Rachel's father died of a cure like yours!"

"Not like ours," he says, and I hear in his voice the utter conviction of the young. Of the energetic. Of the Outside. "This is new, and medically completely different. This is the right strain."

"And you want me to try this new right strain as your guinea pig."

There is a moment of electric silence. Eyes shift: gray, blue, brown. Even before Rachel rises from her stool or McHabe says, "We think the ones with the best chances to avoid scarring are young people without heavy skin manifestations," I know. Rachel puts her arms around me. And Jennie—Jennie with the red ribbon woven in her hair, sitting on her broken chair as on a throne, Jennie who never heard of neurotransmitters or slow viruses or risk calculations—says simply, "It has to be me," and looks at McHabe with eyes shining with love.

I say no. I send McHabe away and say no. I reason with both girls and say no. They look unhappily at each other, and I wonder how long it will be before they realize they can act without permission, without obedience. But they never have.

We argue for nearly an hour, and then I insist they go on to the dance, and that I go with them. The night is cold. Jennie puts on her sweater, a heavy hand-knitted garment that covers her shapelessly from neck to knees. Rachel drags on her donated coat, black synthetic frayed at cuffs and hem. As we go out the door, she stops me with a hand on my arm.

"Gram—why did you say no?"

"*Why?* Honey, I've been telling you for an hour. The risk, the danger . . . "

"Is it that? Or—" I can feel her in the darkness of the hall, gathering herself together "—or is it—don't be mad, Gram, please don't be mad at me—is it because the cure is a new thing, a change? A . . . different thing you don't want because it's *exciting?* Like Tom said?"

"No, it isn't that," I say, and feel her tense beside me, and for the first time in her life I don't know what the tensing means.

We go down the street towards Block B. There's a Moon and stars, tiny high pinpoints of cold light. Block B is further lit by kerosene lamps and by torches stuck in the ground in front of the peeling barracks walls that form the cheerless square. Or does it only seem cheerless because of what McHabe said? Could we have done better than

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this blank utilitarianism, this subdued bleakness—this peace?

Before tonight, I wouldn't have asked.

I stand in the darkness at the head of the street, just beyond the square, with Rachel and Jennie. The band plays across from me, a violin, guitar, and trumpet with one valve that keeps sticking. People bundled in all the clothes they own ring the square, clustering in the circles of light around the torches, talking in quiet voices. Six or seven couples dance slowly in the middle of the barren earth, holding each other loosely and shuffling to a plaintive version of "Starships and Roses." The song was a hit the year I got the disease, and then had a revival a decade later, the year the first manned expedition left for Mars. The expedition was supposed to set up a colony.

Are they still there?

We had written no new songs.

Peter and Mamie circle among the other couples. "Starships and Roses" ends and the band begins "Yesterday." A turn brings Mamie's face briefly into full torchlight: It's clenched and tight, streaked with tears.

"You should sit down, Gram," Rachel says. This is the first time she's spoken to me since we left the barracks. Her voice is heavy, but not angry, and there is no anger in Jennie's arm as she sets down the three-legged stool she carried for me. Neither of them is ever really angry.

Under my weight the stool sinks unevenly into the ground. A boy, twelve or thirteen years old, comes up to Jennie and wordlessly holds out his hand. They join the dancing couples. Jack Stevenson, much more arthritic than I, hobbles towards me with his grandson Hal by his side.

"Hello, Sarah. Been a long time."

"Hello, Jack." Thick disease ridges cross both his cheeks and snake down his nose. Once, long ago, we were at Yale together.

"Hal, go dance with Rachel," Jack says. "Give me that stool first." Hal, obedient, exchanges the stool for Rachel, and Jack lowers himself to sit beside me. "Big doings, Sarah."

"So I hear."

"McHabe told you? All of it? He said he'd been to see you just before me."

"He told me."

"What do you think?"

"I don't know."

"He wants Hal to try the cure."

Hal. I hadn't thought. The boy's face is smooth and clear, the only visible skin ridges on his right hand.

I say, "Jennie, too."

Jack nods, apparently unsurprised. "Hal said no."

"*Hal* did?"

"You mean Jennie didn't?" He stares at me. "She'd even consider something as dangerous as an untried cure—not to mention this alleged passing Outside?"

I don't answer. Peter and Mamie dance from behind the other couples, disappear again. The song they dance to is slow, sad, and old.

"Jack—could we have done better here? With the colony?"

Jack watches the dancers. Finally he says, "We don't kill each other. We don't burn things down. We don't steal, or at least not much and not cripplingly. We don't hoard. It seems to me we've done better than anyone ever hoped. Including us." His eyes search the dan-

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cers for Hal. "He's the best thing in my life, that boy."

Another rare flash of memory: Jack debating in some long-forgotten political science class at Yale, a young man on fire. He stands braced lightly on the balls of his feet, leaning forward like a fighter or a dancer, the electric lights brilliant on his glossy black hair. Young women watch him with their hands quiet on their open textbooks. He has the pro side of the debating question: *Resolved: Fomenting first-strike third-world wars is an effective method of deterring nuclear conflict among super-powers.*

Abruptly the band stops playing. In the center of the square Peter and Mamie shout at each other.

"—saw the way you touched her! You bastard, you faithless prick!"

"For God's sake, Mamie, not here!"

"Why not here? You didn't mind dancing with her here, touching her back here, and her ass and . . . and . . . " She starts to cry. People look away, embarrassed. A woman I don't know steps forward and puts a hesitant hand on Mamie's shoulder. Mamie shakes it off, her hands to her face, and rushes away from the square. Peter stands there dumbly a moment before saying to no one in particular, "I'm sorry. Please dance." He walks towards the band who begin, raggedly, to play "Didn't We Almost Have It All." The song is at least twenty-five years old. Jack Stevenson says, "Can I help, Sarah? With your girl?"

"How?"

"I don't know," he says, and of course he doesn't. He offers not out of usefulness but out of empathy, knowing how the ugly little scene in the torchlight depresses me.

Do we all so easily understand depression?

Rachel dances by with someone I don't know, a still-faced older man. She throws a worried glance over his shoulder: now Jennie is dancing with Peter. I can't see Peter's face. But I see Jennie's. She looks directly at no one, but then she doesn't have to. The message she's sending is clear: I forbade her to come to the dance with McHabe, but I didn't forbid her to dance with Peter and so she is, even though she doesn't want to, even though it's clear from her face that this tiny act of defiance terrifies her. Peter tightens his arm and she jerks backward against it, smiling hard.

Kara Desmond and Rob Cottrell come up to me, blocking my view of the dancers. They've been here as long as I. Kara has an infant great-grandchild, one of the rare babies born already disfigured by the disease. Kara's dress, which she wears over jeans for warmth, is torn at the hem; her voice is soft. "Sarah. It's great to see you out." Rob says nothing. He's put on weight in the few years since I saw him last. In the flickering torchlight his jowly face shines with the serenity of a diseased Buddha.

It's two more dances before I realize that Jennie has disappeared.

I look around for Rachel. She's pouring sumac tea for the band. Peter dances by with a woman not wearing jeans under her dress; the woman is shivering and smiling. So it isn't Peter that Jennie left with. . . .

"Rob, will you walk me home? In case I stumble?" The cold is getting to my arthritis.

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Rob nods, incurious. Kara says, "I'll come, too," and we leave Jack Stevenson on his stool, waiting for his turn at hot tea. Kara chatters happily as we walk along as fast as I can go, which isn't as fast as I want to go. The Moon has set. The ground is uneven and the street dark except for the stars and fitful lights in barracks windows. Candles. Oil lamps. Once, a single powerful glow from what I guess to be a donated stored-solar light, the only one I've seen in a long time.

Korean, Tom said.

"You're shivering," Kara says. "Here, take my coat." I shake my head.

I make them leave me outside our barracks and they do, unquestioning. Quietly I open the door to our dark kitchen. The stove has gone out. The door to the back bedroom stands half open, voices coming from the darkness. I shiver again, and Kara's coat wouldn't have helped.

But I am wrong. The voices aren't Jennie and Tom.

"—not what I wanted to talk about just *now*," Mamie says.

"But it's what I want to talk about."

"Is it?"

"Yes."

I stand listening to the rise and fall of their voices, to the petulance in Mamie's, the eagerness in McHabe's.

"Jennie is your ward, isn't she?"

"Oh, Jennie. Yes. For another year."

"Then she'll listen to you, even if your mother . . . the decision is yours. And hers."

"I guess so. But I want to think about it. I need more information."

"I'll tell you anything you ask."

"Will you? Are you married, Dr. Thomas McHabe?"

Silence. Then his voice, different. "Don't do that."

"Are you sure? Are you really sure?"

"I'm sure."

"Really, really sure? That you want me to stop?"

I cross the kitchen, hitting my knee against an unseen chair. In the open doorway a sky full of stars moves into view through the termite hole in the wall.

"Ow!"

"I said to stop it, Mrs. Wilson. Now please think about what I said about Jennie. I'll come back tomorrow morning and you can—"

"*You* can go straight to hell!" Mamie shouts. And then, in a different voice, strangely calm, "Is it because I'm diseased? And you're not? And Jennie is not?"

"*No*. I swear it, no. But I didn't come here for this."

"No," Mamie says in that same chill voice, and I realize that I have never heard it from her before, never. "You came to help us. To bring a cure. To bring the Outside. But not for everybody. Only for the few who aren't too far gone, who aren't too ugly—who you can *use*."

"It isn't like that—"

"A few who you can rescue. Leaving all the rest of us here to rot, like we did before."

"In time, research on the—"

"Time! What do you think time matters Inside? Time matters shit here! Time only matters when someone like you comes in from the Outside, showing off your healthy skin and making it even

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worse than it was before with your new whole clothing and your working wristwatch and your shiny hair and your . . . your . . . " She is sobbing. I step into the room.

"All right, Mamie. All right."

Neither of them reacts to seeing me. McHabe just stands there until I wave him towards the door and he goes, not saying a word. I put my arms around Mamie and she leans against my breast and cries. My daughter. Even through my coat I feet the thick ropy skin of her cheek pressing against me, and all I can think of is that I never noticed at all that McHabe wears a wristwatch.

Late that night, after Mamie has fallen into damp exhausted sleep and I have lain awake tossing for hours, Rachel creeps into our room to say that Jennie and Hal Stevenson have both been injected with an experimental disease cure by Tom McHabe. She's cold and trembling, defiant in her fear, afraid of all their terrible defiance. I hold her until she, too, sleeps, and I remember Jack Stevenson as a young man, classroom lights glossy on his thick hair, spiritedly arguing in favor of the sacrifice of one civilization for another.

Mamie leaves the barracks early the next morning. Her eyelids are still swollen and shiny from last night's crying. I guess that she's going to hunt up Peter, and I say nothing. We sit at the table, Rachel and I, eating our oatmeal, not looking at each other. It's an effort to even lift the spoon. Mamie is gone a long time.

Later, I picture it. Later, when Jennie and Hal and McHabe have come and gone, I can't stop picturing it: Mamie walking with her swollen eyelids down the muddy streets between the barracks, across the unpaved squares with their corner vegetable gardens of rickety bean poles and the yellow-green tops of carrots. Past the depositories with their donated Chinese and Japanese and Korean wool and wood stoves and sheets of alloys and unguarded medicines. Past the chicken runs and goat pens. Past Central Administration, that dusty cinder-block building where people stopped keeping records maybe a decade ago because why would you need to prove you'd been born or had changed barracks? Past the last of the communal wells, reaching deep into a common and plentiful water table. Mamie walking, until she reaches the Rim, and is stopped, and says what she came to say.

They come a few hours later, dressed in full sani-suits and armed with automatic weapons that don't look American-made. I can see their faces through the clear shatter-proof plastic of their helmets. Three of them stare frankly at my face, at Rachel's, at Hal Stevenson's hands. The other two won't look directly at any of us, as if viruses could be transmitted over locked gazes.

They grab Tom McHabe from his chair at the kitchen table, pulling him up so hard he stumbles, and throw him against the wall. They are gentler with Rachel and Hal. One of them stares curiously at Jennie, frozen on the opposite side of the table. They don't let McHabe make any of the passionate explanations he had been trying to make to me. When he tries, the leader hits him across the face.

Rachel—*Rachel*—throws herself at the man. She wraps her strong young

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arms and legs around him from behind, screaming, "Stop it! Stop it!" The man shrugs her off like a fly. A second soldier pushes her into a chair. When he looks at her face he shudders. Rachel goes on yelling, sound without words.

Jennie doesn't even scream. She dives across the table and clings to McHabe's shoulder, and whatever is on her face is hidden by the fall of her yellow hair.

"Shut you fucking 'doctors' down once and for all!" the leader yells, over Rachel's noise. The words come through his helmet as clearly as if he weren't wearing one. "Think you can just go on coming Inside and Outside and diseasing us all?"

"I—" McHabe says.

"Fuck it!" the leader says, and shoots him.

McHabe slumps against the wall. Jennie grabs him, desperately trying to haul him upright again. The soldier fires again. The bullet hits Jennie's wrist, shattering the bone. A third shot, and McHabe slides to the floor.

The soldiers leave. There is little blood, only two small holes where the bullets went in and stayed in. We didn't know, Inside, that they have guns like that now. We didn't know bullets could do that. We didn't know.

"You did it," Rachel says.

"I did it for you," Mamie says. "I did!" They stand across the kitchen from each other, Mamie pinned against the door she just closed behind her when she finally came home, Rachel standing in front of the wall where Tom died. Jennie lies sedated in the bedroom. Hal Stevenson, his young face anguished because he had been useless against five armed soldiers, had run for the doctor who lived in Barracks J, who had been found setting the leg of a goat.

"You did it. You." Her voice is dull, heavy. *Scream*, I want to say. *Rachel, scream.*

"I did it so you would be safe!"

"You did it so I would be trapped Inside. Like you."

"You never thought it was a trap!" Mamie cries. "*You* were the one who was happy here!"

"And you never will be. Never. Not here, not anyplace else."

I close my eyes, to not see the terrible maturity on my Rachel's face. But the next moment she's a child again, pushing past me to the bedroom with a furious sob, slamming the door behind her.

I face Mamie. "Why?"

But she doesn't answer. And I see that it doesn't matter; I wouldn't have believed her anyway. Her mind is not her own. It is depressed, ill. I have to believe that now. She's my daughter, and her mind has been affected by the ugly ropes of skin that disfigure her. She is the victim of disease, and nothing she says can change anything at all.

It's almost morning. Rachel stands in the narrow aisle between the bed and the wall, folding clothes. The bedspread still bears the imprint of Jennie's sleeping shape; Jennie herself was carried by Hal Stevenson to her own barracks, where she won't have to see Mamie when she wakes up. On the crude shelf beside Rachel the oil lamp burns, throwing shadows on the newly-whole wall that smells of termite exterminator.

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She has few enough clothes to pack. A pair of blue tights, old and clumsily darned; a sweater with pulled threads; two more pairs of socks; her other skirt, the one she wore to the Block dance. Everything else she already has on.

"Rachel," I say. She doesn't answer, but I see what silence costs her. Even such a small defiance, even now. Yet she is going. Using McHabe's contacts to go Outside, leaving to find the underground medical research outfit. If they have developed the next stage of the cure, the one for people already disfigured, she will take it. Perhaps even if they have not. And as she goes, she will contaminate as much as she can with her disease, depressive and nonaggressive. Communicable.

She thinks she has to go. Because of Jennie, because of Mamie, because of McHabe. She is sixteen years old, and she believes—even growing up Inside, she believes this—that she must do something. Even if it is the wrong thing. To do the wrong thing, she has decided, is better than to do nothing.

She has no real idea of Outside. She has never watched television, never stood in a bread line, never seen a crack den or a slasher movie. She cannot define napalm, or political torture, or neutron bomb, or gang rape. To her, Mamie, with her confused and self-justifying fear, represents the height of cruelty and betrayal; Peter, with his shambling embarrassed lewdness, the epitome of danger; the theft of a chicken, the last word in criminality. She has never heard of Auschwitz, Cawnpore, the Inquisition, gladitorial games, Nat Turner, Pol Pot, Stalingrad, Ted Bundy, Hiroshima, My-Lai, Wounded Knee, Babi Yar, Bloody Sunday, Dresden or Dachau. Raised with a kind of mental inertia, she knows nothing of the savage inertia of destruction, that once set in motion a civilization is as hard to stop as a disease.

I don't think she can find the underground researchers, no matter how much McHabe told her. I don't think her passage Outside will spread enough infection to make any difference at all. I don't think it's possible that she can get very far before she is picked up and either returned Inside or killed. She cannot change the world. It's too old, too entrenched, too vicious, too *there*. She will fail. There is no force stronger than destructive inertia.

I get my things ready to go with her. ■

If we had to tolerate in others all that we permit in ourselves, life would become completely unbearable.

Georges Courteline

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Jay Kay Klein's biolog

Science fiction has its own K-T boundary, where nearly all previous authors disappeared and were replaced by new ones. This boundary is just two years thick at the point of impact in *Analog (ASF)*. John W. Campbell, Jr. was the irresistible editor who struck this magazine in 1937, and by 1939 had transformed the world of science fiction.

Only a few authors made the transition and were able to compete with the new-style writers, though some lingered as living fossils in other magazines. Harry O. Bates was the first editor in January 1930, of what was originally called *Astounding Stories of Super-Science*. His last was March 1933, with an issue bearing a beautiful cover intended for an E.E. Smith story that was yanked when *ASF* suspended publication for six issues due to the Great Depression. A popular author of the day himself, Bates's writers included nearly all of the once-familiar names that are now nearly forgotten: Miles J. Bruer, Ray Cummings, Sewell Peaslee Wright, Paul Ernst, Captain S.P. Meek, Arthur J. Burks, Harl Vincent, Charles W. Diffin, Ralph Milne Farley, R.F. Starzl, Francis Flagg, Wallace West, H.G. Winter, Donald Wandrei, Clark Ashton Smith, Nat Shachner, and Arthur Leo Zagat. From out of the past, Hugh B. Cave had an SF novel published a year back by TOR Books.

Also appearing during Bates's editorship were Lloyd Arthur Eshbach, Edmond Hamilton, Murray Leinster, C.L. Moore, and Jack Williamson, who continued as *ASF* writers into our own time. Of these, Eshbach is living in Myerstown, PA, and in 1983 published *Over My Shoulder*, an autobiography of his life in science fiction; Williamson retired as professor of English at the University of Eastern New Mexico, in Portales, and continues as one of SF's most popular authors.

When Frederick Orlin Tremaine took over the editorship, he proved to be the only *ASF* editor who was not an accomplished writer, though he did publish some stories under absolutely unremembered names. He accomplished a changeover from "exotic adventures" to stories centered around ideas, well laced with the latest scientific discoveries of the day.

New writers appeared, including Stanton A. Coblentz, John Russell Fearn, Frank Belknap Long, and Raymond Z. Gallun. E.E. "Doc" Smith made his first *ASF* appearance August 1934, with *The Skylark of Valeron*, stretched over seven issues to ensure high newsstand sales; his subsequent stories in the 1940s were equally popular with the readers. John W. Campbell appeared in the December, 1934 issue with *The Mightiest Machine*, a blockbuster of a story in five parts that demonstrated a popularity equal to that of Doc Smith. As Don A. Stuart, Campbell had appeared in the previous issue with "Twilight," one of the great stories still reprinted today. The difference in style and content between "Campbell" and "Stuart" was so great, you can wonder if in some people there's a particularly deep left brain/right brain split.

Stanley Weinbaum appeared, too, in an all-too-short career. New, well-received writers continued to arrive: Eando (Earl and Otto) Binder, Ross Rocklynne, John Taine. H.P. Lovecraft made two appearances, characteristically with science fiction stories so outré they had the feel of Gothic horror tales. The famous scientist John (J.R.) Pierce had several appearances so early he hadn't yet received his Ph.D. Years later, when director of Bell Labs, he wrote as "J.J. Coupling;" he is now at Stanford University. The prolific contributor J. Harvey Haggard is alive and well in San Bernadino, CA.

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Manly Wade Wellman, P. Schuyler Miller, Nelson S. Bond, Willy Ley, and Oliver Saari had stories the last year before Campbell took over, at age 27, with the October, 1937 issue. Already, authors that would represent modern SF were starting to appear, but Campbell began developing a unique "stable" of *ASF* writers, suggesting ideas, detailing what was needed in rewrites, and especially infusing enthusiasm in technologically knowledgeable people for writing a new style of story. Campbell got first choice of these stories since *ASF* paid the highest rates of any SF magazine.

"Brass Tacks" was an innovation with the January, 1938 issue, and is still going strong. Nor would an *ASF* issue till this day be complete without a first-class science article or two. The cover was to become less "pulpy" and more of a thoughtful window into the lead story. The stories often were written from the standpoint of tales that might appear in a magazine of the future where scientific marvels were part of the background. *Astounding Stories* became *Astounding Science-Fiction* in March of that year, adding "The Analytical Laboratory" and "In Times to Come" in May. Very significantly, the Editorial was moving from a single page deep in the interior to a featured place behind the contents page.

Everything came together in the July, 1939 issue, famous as marking the start of modern SF and the Golden Age of SF. The cover heralded the first *ASF* appearance of A.E. van Vogt, and inside was the first major appearance of Isaac Asimov. The other writers had indeed appeared before, such as C.L. Moore in October 1934, but now their stories were crisply written in modern "this-is-the-way-the-future-is" style. Canadian van Vogt is now in Los Angeles, still writing. Isaac Asimov is back in New York City after a sojourn as professor of biochemistry at Boston University. To say he is still writing is an understatement. Robert Heinlein appeared in the succeeding August issue with his first "Future History" story.

Lester del Rey, L. Ron Hubbard, Henry Kuttner, Malcolm Jameson, and H.L. Gold had been introduced to *ASF* readers the year before. Very significantly, L. Ron Hubbard's background article on *Dianetics* was to appear in 1950 with a ringing endorsement by Campbell and Dr. A.J. Winter. Lester del Rey is in New York as a senior editor in the publishing company bearing his name.

From here on, new writers popped up in nearly every issue. The list of *ASF* writers now considered part of the "classical" canon is overwhelming. Like nearly all of the older writers, many of the first writers of modern SF are no longer with us, even though their stories are still available in anthologies. These are highly readable unlike nearly all pre-Campbell writings that, sadly but truthfully, can only be read by historians of the field or masochists. Significantly, contact with Campbell by some of the older writers resulted in a rejuvenation of their writing.

Dr. Milton A. Rothman, who first appeared in *ASF* in August, 1939 as "Lee Gregor," has appeared in *ASF* once again not long ago. He is back in Philadelphia after retiring as a physicist working on fusion power. Son Tony Rothman, with a Ph.D. in physics, continues the family tradition of science and science fiction writing. L. Sprague de Camp has recently moved from Philadelphia to Texas, with more writing to come. Poul Anderson is in the San Francisco area and writing steadily. Algis Budrys is in the Chicago area, working with new SF writers as coordinator of the Writers of the Future contest. Arthur C. Clarke is one of Sri Lanka's most prominent residents, a world traveler and lecturer, and a best-selling SF novelist. Hal Clement continues as a very popular science teacher at a private school in the Boston area and will be the author guest of honor at the 1991 world SF convention in Chicago. Gordon R. Dickson continues writing from his Minneapolis home. Harry Harrison moved from New York, where he started out as an artist, first to Denmark, and now has lived for many years in Ireland, where Anne McCaffrey also

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makes her home. Fritz Leiber is active in San Francisco. Dean McLaughlin is in Ann Arbor, where for many years he was the proprietor of a bookshop. Larry Niven moved a few years back to Tarzana, CA. Alan Nourse, M.D. is near Seattle and is nationally known as a medical columnist. Dr. Chad Oliver is in Austin, where he was head of the university's anthropology department for many years. Frederik Pohl, now in Palatine, IL, continues writing and is a sought-after futurist lecturing at business and government gatherings. Fred Saberhagen left Chicago where he helped edit the *Britannica* and moved to Albuquerque. Robert Silverberg, once an *ASF* "two-headed author" with Randall Garrett as "Robert Randall" moved some years back from New York to the San Francisco area.

The names of *ASF* writers are inscribed in the history of SF as Hugo and Nebula winners and world SF convention guests of honor. To list everyone who helped shape *ASF* would take the better part of a whole issue. When John Campbell died in 1971, Ben Bova became editor, moving *ASF* into the future with delicate changes intended to infuse contemporary literary values into *ASF*'s "hard science" orientation. He added the "Biolog" column in 1977. In 1978 he left *ASF* to freelance, adding first the job of fiction editor at *Omni* and then becoming its head editor for some years before returning to full-time writing from his home in West Hartford, CT. Dr. Stanley Schmidt continued the *ASF* tradition of having a writer with a scientific education as editor. The December 1977 "Biolog" noted that Dr. Schmidt was assistant professor of physics at an Ohio college.

Almost unknown to present readers, *ASF* has had two fantasy companions that were this hard-science magazine's left brain/right brain alter ego. *Strange Tales* ran seven issues from September 1931 to January 1933 under the editorship of Harry Bates, and with many of *ASF*'s writers of the time, including Jack Williamson. *Unknown Worlds* headed by John Campbell had 39 issues from March 1939 to June 1943 when wartime paper shortages killed it—though it was wildly popular with its readers. Many of the *ASF* writers enjoyed crossing over to *Unknown* and that included L. Ron Hubbard, L. Sprague de Camp, Henry Kuttner, Theodore Sturgeon, Eric Frank Russel, Fritz Leiber, Jr., Alexander M. Phillips, A.E. van Vogt, Lester del Rey, Robert Heinlein, C.L. Moore, and even Isaac Asimov with one story. They wrote fantasies, often with humor and sometimes with chilling horror, but always with the applied logic of an engineering slide rule. The results were stories unlike any fantasies before or since.

All but a very few of the writers before *ASF* introduced modern SF are gone from the scene, and even most of those from the first years of SF's golden age. The SF writing species, though, have diversified astoundingly and spread out into not only specialized SF niches but also into the entire world of literature, including the new visual media. In *ASF* you now meet such notable specimens as Gregory Benford, David Brin, Michael F. Flynn, W.T. Quick, Elizabeth Moon, Robert Chase, Joseph Delaney, Pauline Ashwell, Marc Stiegler, Harry Turtledove, Rob Chilson, Timothy Zahn, W.R. Thompson, Jerry Oltion, Lois McMaster Bujold, Charles Sheffield, and Arlan Andrews. With science articles by John Cramer, Margaret Silbar, Robert Forward, and Harry Stine, the *ASF* Biologist's examining lens will never run out of material. ●

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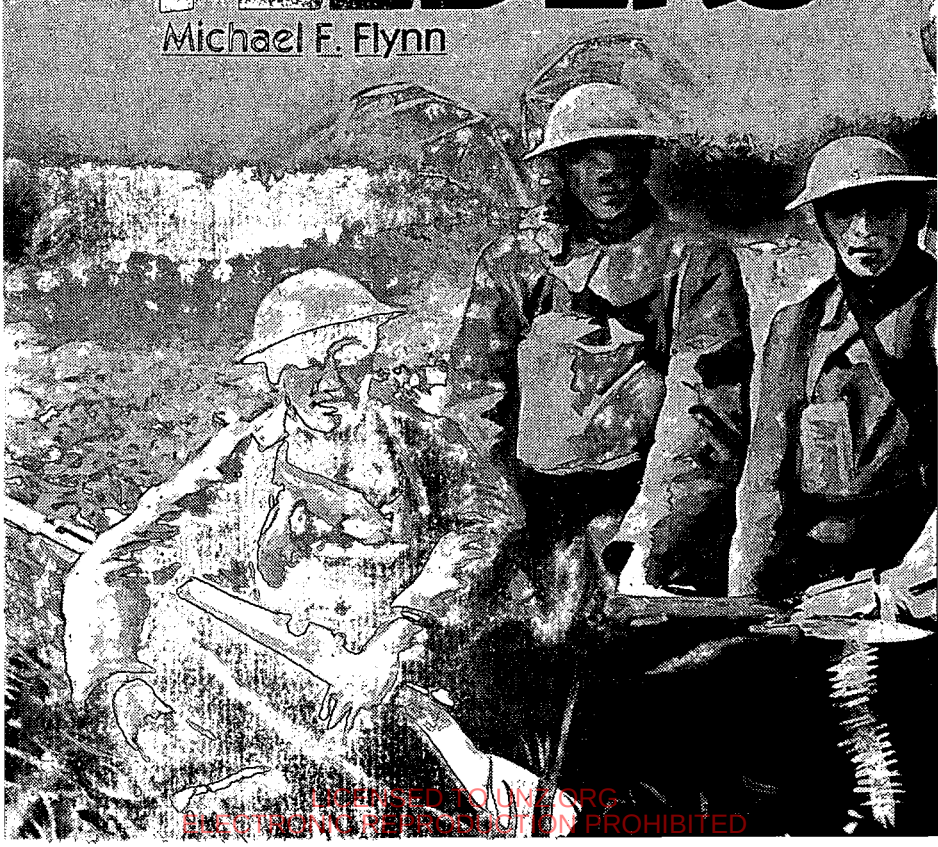
Nicholas Jainschigg

If they were real, they were among the strangest aliens ever imagined. Or perhaps not so alien after all. . . .

THE FEEDERS

Michael F. Flynn



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It was in the bloody slaughter of the Ardennes that Heinrich Mauer first saw the creatures.

The company was advancing in a skirmish line through the dark, haunted forests when a battery of French 75's let loose. Fountains of earth erupted like geysers and the skirmish line dropped in a flutter of trench coats, their spiked helmets bobbing as the soldiers scratched a hasty trench in the moist soil. The shells and the men screamed.

Heinrich scraped frantically at the earth. The smell of clay and loam was in his nostrils. He turned to the man on his left. "At the training school they taught us that the French did not use artillery to prepare an attack."

Karl grinned. "Perhaps their commander attended a different school. You feel betrayed? Dig! Their infantry will be coming."

The captain was running down the line. He pointed at Heinrich. "You! Lay down some barbed wire in front of us!" The shells whistled and crashed in the trees. One exploded nearby and the captain ducked.

Karl took Heinrich's rifle. "Come back when you are done," he said. "We'll wait."

Heinrich grabbed a spool of wire and ran parallel to the trench a few yards in front of it. The spool whirled on its handles and a cruel hedge of entanglement grew in his wake. Another soldier followed, bracing the wire with posts.

The earth suddenly heaved next to Heinrich and dirt and rocks sprayed in the air. There was a flash of light and a roar. Something hard struck him on the side of his head and his eyesight went double. As he fell he thought, *I am a dead man.*

He lay on the ground and waited for death to claim him. His breath came in short, rapid gulps. Flashes of memory: His *Gemeinde* and how cool the banks of the Neckar were. . . . And the University at Karlsruhe that he would never attend now. . . . And Magda and how smooth and white her skin was. . . . And what they did and didn't do together. Above him, a double set of trees stretched spinning skyward, converging into a blurred canopy overhead. The air was thick with the scent of pine.

The roar of the 75's ceased.

He thought, *Now their infantry will attack.* He put his hand to his head and it came away bloody. The dizziness passed and he realized suddenly that he would live. For at least a short while longer.

A noise like the thrumming of a million bees grew in the background. It was the sound of hundreds of human voices joined in a great chorus, shouting desperately and loudly so that they would not be afraid to charge the enemy. Heinrich scrabbled in the dirt, crawling toward the safety of the trench.

Hands grabbed him and pulled him into the makeshift shelter. His rifle was thrust at him. "They're coming," he heard someone say. He raised his head dazedly and saw a great cloud of red and blue pouring through the trees. The French Infantry. Their brightly colored uniforms made them stand out clearly against the background. With his vision still doubled, there seemed twice as many as there really were. The machine

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gun to his right began to chatter and the charging men fell like wheat.

My helmet! He had lost it when the shell hit. He looked around. And he saw the creature.

The creature squatted on the broken stump of a tree. It was small and bony, pale yellow in color and obscenely naked. It looked a little bit like a monkey and a little bit like a bat and a little bit like nothing he had ever seen before. The skin was shiny, with no trace of hair or scales, and hung on the beast in loose folds. The skull was narrow and pointed and the eyes glowed like two red coals. Its mouth was an open pit of blackness, gaping in a soundless shriek.

Heinrich was paralyzed, unable to move. It was like some old woodcut of a medieval Satan, done in miniature. For an instant he wondered if he really had died and this was hell.

The creature stretched. Two batlike wings thrust out from its shoulders. With a flap like the rustle of ancient paper, it soared into the air. Tracking its flight, Heinrich saw scores of the beasts. They were in the air. They were clinging to the trees. They were alighting on the French and German soldiers; and appeared to be biting them.

Heinrich Mauer cowered in the trench. A whimper escaped his throat. What in the name of Heaven was happening?

No one else seemed to notice the creatures. A burly Frenchman charging straight at him had one wrapped tightly around his neck, yet he showed no signs that he knew it was there.

Heinrich shook the man on his right. "Do you see them!?"

But the man's face was a bloody ruin. Heinrich's stomach heaved even as he brought his bayonet up. He held it steady, fighting the urge to retch.

At training camp, the instructor had taught that hate was a vital element of the bayonet drill. Hate the enemy; despise him. There could be no room for compassion, or even for neutrality, in this most personal form of modern combat. A single moment's hesitation could be fatal.

Scream! Thrust! Tear!

But Heinrich could conjure no other emotion than numbing terror. When the Frenchman was close enough, he screamed and lunged. The scream was closer to desperation than hate, but the lunge was effective enough. A sea of red spread across the enemy's topcoat. Heinrich twisted the bayonet and the man collapsed across him, pinning him to the ground.

He choked under the weight of the body. He could feel the warm blood soaking into his own uniform. The Frenchman's face was pressed into his like a lover's. Heinrich tried to push him away and found himself staring into the other's eyes.

It was a young face, no older than his own. Not a hardened warrior at all. A few hairs sketched a tentative moustache across his lip. He stared at Heinrich with bewilderment. His mouth opened as if he were trying to say something, but all that escaped his lips was a drawn-out sigh. Then the eyes filmed over and stared not at Heinrich, but at some point a long distance off.

Heinrich became aware that, at death, a man's bowel and bladder relaxed. The thought of it made him gag. This time he did not hold back and the sour liquid

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drained into the earthen floor of the trench.

When he looked up again, he realized that the shouting and gunfire had stopped. He heard German voices. He pushed at the body and it fell away from him. He crawled to the lip of the trench and looked. Hundreds of bodies, both field grey and red-and-blue, carpeted the forest floor. Some of the bodies stood upright, held in place by flying buttresses of corpses. Heinrich saw the machine gunner, Georg, sitting dumb behind his weapon, staring at it in disbelief. Soldiers were sitting or lying, staring into space or weeping.

He did not know which sight affected him the most. The impersonal architecture of death, the grotesque cathedral of corpses that had been carved from the attacking infantry; or the lone man he had slain with his own two hands. He glanced at his hands and saw that the blood had run down them and he wiped them on his jacket in a convulsive gesture.

He crawled to the lip of the trench and pressed his cheek against the cool earth. So this was war. That was the glory of battle. Hours of foot-numbing marches followed by a few moments of utter terror. He glanced at the boy he had killed. A man, he supposed. The army made a man of you, because it made you old, old.

He remembered the parades that had seen him off with his comrades. Bands playing *Pariser Eintrittsmarsch* and *Der Jäger aus Kurzpfalz*. Girls running up to them, thrusting flowers into their lapels, throwing arms around their necks and kissing them. Old men and women weeping for joy that at last *Der Tag* had come.

The captain and a squad of five were stalking the wounded. Whenever they found a Frenchman who still lived, they shot him through the temple. Most of the soldiers averted their gaze in revulsion; but Heinrich could not tear his eyes away. The captain had one of the creatures riding on his back.

Heinrich looked wildly around the battlefield. They were everywhere. They clung to the trees or squatted among the bodies. Their heads darted from side to side. Heinrich thought of vultures and wondered why they did not fall on and devour the dead.

If he could still see them, he thought, then they must be real. Or he had gone irretrievably mad. And which alternative was worse? Were they then an illusion caused by his wound? Or had they always been there, unseen? Fluttering about him invisibly. Somehow that thought terrified him more than the actual sight.

Then the Skoda 305s laying siege to Namur opened up, and the horizon grew red and the ground trembled, even this far away. Smoky red devil eyes turned north and the horde of creatures took wing and soared, leaving the corpses and the smoking desolation.

The captain, of course, received a medal.

The Crown Prince himself came to the blasted village where Heinrich's company was resting. A platform was erected in the ruins of the town square and the prince made a speech from it.

Heinrich had tried not to think of the devil-bats. In the days since the battle

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their horror had faded and he began to believe that he had imagined them. Once or twice he thought he had glimpsed one; but it was always at a distance and he could not be certain. He had spoken to no one about them; not to his comrades and not to the company doctor who certified him fit for duty. Best to say nothing, he had decided. Heinrich had no desire to be shut away in a madhouse. No, keep the horror to himself. Perhaps everyone had seen them. Perhaps devil-bats were as common as flies on a dunghill, and the same fear kept everyone silent.

So he stood in the square, his back ramrod-stiff, in ranks with his comrades, and listened to the prince drone. The flag of the Fourth Army snapped in the hot August breeze. Heinrich had already learned the old soldier's trick of surviving such speeches. He let his eyes glaze over. He tensed his thigh muscles alternately to keep the blood from pooling in his legs. Only snatches of the speech reached him. " . . . bravery of such fine officers . . . " " . . . French resistance smashed . . . " " . . . enemy in headlong retreat . . . " " . . . success in Belgium guaranteed . . . " "home before the leaves fall . . . "

Ah, now that was a thought! Home before the leaves fall. Would he and Magda picnic again in the Black Forest? He wondered if Magda would wait for his discharge, as she had promised. He imagined Papa meeting him at the train station, decked out in his old uniform and medals. The Kingdom of Bavaria, a country which no longer existed; a warfare that no longer existed. And yet, Papa must have stood in parades like this one; must have lived through terror as intense as his own. Suddenly he regretted not having listened more closely to the old man's rambling tales.

The captain and two other officers marched smartly to the fore and the prince and his aides met them with a tray of medals. Heinrich sensed movement in the corner of his eye. The flapping of wings; and the faint sound of rustling curtains.

Heinrich turned his head, then quickly snapped it back. The devil-bats were coming. Six of them. They circled the town square, dipping and weaving. Two of the pale-skinned creatures alighted upon officers standing in the ranks, and a third draped itself around one of the crown prince's aids. The remaining three circled the medalists, settling first on the shoulders of the captain, then on those of the second officer.

The last creature wheeled slowly. It dipped toward the remaining man, then veered off and circled once more. Its companions watched its progress with their large red eyes. In the end, it perched upon a nearby tree branch. The burning eyes were expressionless.

Heinrich closed his own eyes and wished them away. *Dear God,* he thought. *Let them not be there!*

He opened his eyes.

The six were still there. Two of them seemed to be looking in his direction. Terror was an icicle in his heart. *Don't think about them. Think about anything else. Magda. The Kaiser. The soccer game the day before his induction.*

The creatures looked away.

The one in the tree took wing suddenly. It circled the captain. The creature already perched there watched a

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moment, then it raised its own wings and the two changed places.

How kind, thought Heinrich crazily. He felt dizzy and, despite his precautions, he did pass out at last.

"Heinrich? Heinrich? It *is* you!"

He opened his eyes. He was lying in a cot. Nursing orderlies strode about with an air of importance. *I must be in battalion hospital,* he thought groggily. He turned to see who had spoken.

"Sepp!" he exclaimed. "Sepp Zimmerman! So the Kaiser has gotten you as well."

The man in the next cot had his leg wrapped in bandages. He grinned at Heinrich. "I would guess that there are few enough men of fighting age left in our village. Just the old men and the cow boys left to bring in the harvest."

Heinrich grunted. "Ach, we will be back before harvest moon. The decisive battle has been fought and we have won. That is how modern war is. All the books have said so. One decisive battle and everyone goes home. The French are beaten. All that is left for us now is to gather them up."

"Perhaps," said Sepp doubtfully. "But, if the French are beaten, I think someone has forgotten to tell them so. My unit fought at Onhaye. The French may be retreating; but they are not fleeing. They are taking their weapons with them. They are fighting hard at every bridgehead. My lieutenant was given a medal, but the enemy escaped nevertheless."

"A medal?" Heinrich remembered the ceremony; the creatures. "Was he one of the three today?"

"Yes. The one on the far right. Perhaps you saw him."

Heinrich remembered that the creatures had avoided that officer. He was suddenly consumed by an overwhelming desire to know why. "And what act of heroism did he perform?"

Sepp shrugged. "Who knows? A dozen. A score. He was a wild man on the battlefield. He was everywhere, rallying our men against the French counterattack. For myself, I believe he was terrified; but then the line between fright and courage is not always clear."

"Courage is doing what you must when you are frightened," Heinrich quoted.

"Perhaps." Sepp allowed the possibility. "Now he is a hero of the Reich." He hunched over conspiratorially. "But the plain truth of it," he explained, "is that the lieutenant agrees with me. He did not even want the medal. He told us that he had only done his duty and no soldier should expect a medal for that. He was only happy that we were at last breaking the vicious Encirclement that England, France, and Russia had thrown around us."

"I thought we were fighting to avenge an Austrian archduke."

"So. We avenge a Serbian murder of an Austrian by attacking the Belgians?" Sepp laughed cynically. "No, my friend, the issues are much larger than that. *Realpolitik,*" he said importantly. German was a fine tongue for building new words out of old ones. "*Realpolitik* and the struggle for African colonies and our rightful place in the sun that the decadent British have denied us for so long." His grin faded. He fell silent and looked away. "Could

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this slaughter be justified on any grounds less lofty? The machine guns." He shook his head. "My God, the machine guns. Who could have imagined it?"

The orderly came and released Heinrich for duty once more. Sepp accompanied him through the village. Sepp walked with the aid of a crutch and Heinrich carried his friend's things for him. Rubble from the bombardment littered the streets. Heinrich asked a military policeman where his unit was bivouacked and they turned their steps in that direction.

Heinrich found himself watching the sky. Sepp looked at him. "Expecting French aeroplanes?" he asked.

Heinrich started. "No," he said quickly. "Just daydreaming." They continued in silence for a short while. Then Heinrich spoke again. "Tell me, Sepp. Do you believe in spirits?"

Sepp gave him a puzzled look. "The priests taught us about devils and angels and souls and God. But that was a long time ago; and I was a child."

"I had thought myself an unbeliever also," said Heinrich abstractedly.

Sepp nudged him with his elbow. "What? Have you found God in the trenches, then?" His voice was mocking.

"Not God. Maybe devils."

Sepp's face turned serious. "You have that right," he admitted. "This battle has had horror enough for a dozen hells. I think the horses are the worst part. They way they scream and kick." He shook his head slowly. "The sights I have seen . . . "

Heinrich waited, wondering if Sepp had seen any sight like the one Heinrich had seen. The horses, he thought, were something short of being the worst. But Sepp was looking to the side of the road.

"Ach, but here is a bit of Heaven for contrast."

Heinrich looked also and saw a Frenchwoman. She was old, perhaps thirty or more, and was blackened with smoke and dirt. She was digging in the ruins of one of the houses. Her clothing was torn and ragged and, when she bent over, Heinrich could see her breasts.

"Hey! Pretty one!" called Sepp. The woman looked up and regarded them neutrally. "Come, Heinrich." Sepp tugged at his arm. "You don't need to report immediately, do you?"

Heinrich hesitated. He knew what Sepp had in mind. "Well, Magda and I promised each other. . . ." Sepp laughed.

"Then imagine you are with her while you do it. That is how a soldier remains faithful to his girl."

"But she will wait for me."

"Surely, but she will wait on her back."

Heinrich drew himself up. "Magda is a virgin!" he said hotly.

"And I am Prince Bismark," Sepp replied. "Don't take it so seriously. Don't tell me you don't want to do it." He tugged on Heinrich's sleeve.

Heinrich looked at the woman again. Memories of Magda competed with the memories of breasts; and, of the two, the latter were the fresher. He allowed Sepp to pull him along and stood to the side while his friend talked to the woman. Heinrich craned his neck for another glimpse down her blouse. Yes, they were very fine. Not so fine as Magda's must be, but . . .

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Sepp leaned his weight on his good leg. He reached out and touched her hair, running his fingers through it. The woman turned her head.

"Sepp, I don't think you should—"

"Ach, nonsense. She likes it. I can tell. Don't you, sweet one?"

The woman looked up, her face a blank. "I must," she said in passable German and her voice was so dead of emotion that Heinrich recoiled.

Sepp wound a lock of hair around his finger. "Is there someplace we can go?"

She turned her head toward the shell of a building beside the rubble where they stood. "There," she said. "The shoemaker, he is dead, and his wife is disappeared. I have use their house now."

Sepp grinned at Heinrich. "You see? She likes it. She wants it. Bring my things. You can be second."

Heinrich thought about the breasts again and felt the longing. So why not? Magda was far away and would never know. It wasn't as if it were love or anything; it was more like a physical release; like eating to calm a hunger. And it would be a way of forgetting about the shells and the devil-bats and the Frenchman with the ragged moustache.

The woman put a hand on Sepp's chest. "Wait. How many you pay?"

"How many?" Sepp blinked, confused by her mangled German.

"Yes! Money? Food? What give you? I say if enough."

Heinrich snorted. "She likes it," he said. "She wants it. She'll sell it, but she won't give it."

Sepp gave him a funny look. "And why should she? What else has she to sell?"

They had reached the entrance to the shoemaker's house and, through the doorway, Heinrich could see a considerable cache of goods: food, a bedroll, cooking utensils, parts of uniforms gradually transforming into skirts. Business, it seemed, was doing very well. Considering how short a time the village had been occupied, the woman had been remarkably active.

Well, she was a survivor, too. Like Heinrich. Like Sepp. Like everyone else who had lived through the Battle of the Frontiers. Perhaps that was all his longing meant. That having dispensed death, he was now compelled to dispense life in a kind of symmetry. Thesis and Antithesis, as the philosophers liked to say.

His thoughts were brought up short. One of the creatures had landed in the path. Heinrich heard his pulse in his ears. *Don't look at it!* The creature walked over to the woman. It was a curious, scuttling walk.

The devil-bat stretched itself up and placed its mouth on the woman's body. Heinrich felt the bile rise in his throat. He closed his eyes and looked away. *It's not there. It's not there.* After a moment, he heard a distant rustling sound. When he opened his eyes the beast was gone. *Thank God,* he thought.

"Heinrich!" hissed Sepp. He looked up and saw that the other two had already gone inside the ruin. Sepp was taking his uniform coat off. The woman had carried something over to her booty pile. Sepp's payment. Heinrich hoped that his friend hadn't given away anything that would cause him trouble with his lieutenant. The woman knelt before

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her hoard; her hand carressed it and a smile flickered at the corners of her mouth.

Na, we all get our pleasures, thought Heinrich, *in different ways*.

The woman pulled her dress up and over her head and she stood there, bare and bony. Heinrich felt himself stir. Magda must look like that, he thought, only fuller and more rounded. His eyes were drawn to her secret places. The woman went to Sepp and wrapped her arms around his neck. Heinrich leaned his rifle against the doorframe and sat back to await his turn. His tongue wet his lips. He hoped he would not embarrass himself when the time came.

Two of the creatures landed on the broken windowsill.

Heinrich closed his eyes and pretended they were not there. *The first one went back and invited a friend for dinner*. It was a mad thought; but something about the creatures' behavior reminded him of feeding.

He opened his eyes, unable to tolerate not seeing, and saw four bodies writhing on the dirty blanket. The woman looked stiff and bored; Sepp grunted and strained atop her. The two creatures kept their faces pressed tightly against Sepp and the woman; but from time to time, one or the other would raise its head and look around. This close to them, he could see that the devil-bats did not have true mouths. The darkness that covered the lower half of their faces was a membrane of some sort. It was darker than the rest of their skin and, from a distance, had given the impression of an ever-gaping maw.

Feeding, he thought. *They must be feeding*. He grabbed his rifle and bolted through the door. One of the creatures looked up at the movement.

"Heinrich!"

He turned at the sound of Sepp's voice. "What?"

"It's your turn."

Heinrich tried not to see the thing on his back. The woman leaned back on her elbows. She smiled at Heinrich and ran the fingers of her right hand up the inside of her thigh. He barely glanced at her. There was nothing the least bit erotic about the sight. The flesh was just flesh. The creature fixed like a leech to her body had made her unclean. He couldn't bring himself to touch her.

"No," he said. "I feel dizzy. My wound." He touched the side of his head. "I need the fresh air." The second creature stared at him with eyes that blazed like lamps. *It knows I see him*, came the unbidden thought and he stumbled outside into the sunlight.

During the next few weeks, Heinrich caught occasional glimpses of the creatures. Now that he knew what to look for, he saw them in many places. The conviction grew on him that the creatures had always been there, invisible save to a maddened few. He wondered if, in the days before he could see them, they had ever ridden his back, or Magda's.

He often saw them engaged in their "feeding," mounted upon his fellow soldiers or upon natives. Frequently, however, they paid no mind to the humans around them. They perched in trees or flew in the air. Sometimes in groups and sometimes alone. Days would pass when he would see none; then, they would be about him in great flocks.

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He learned to expect the things during battle.

And he learned that, if he watched them too long or thought about them too much, he would draw their attention to him. And that meant he must not look at what he saw; must not think about what it meant. Only in that way could he find a measure of calm.

The days fell into a routine. March, fight, rest. March, fight, rest. It was a job. One rested at night; rose and walked to work; did what was required by one's superiors. The young Frenchman he had killed in the Ardennes faded into the anonymity of the masses; became simply one among many. Too many to be seen as individuals. Devil bats were a spray in the air, soaring, swooping, sucking whatever nourishment it was that they obtained from the men who fought. Perhaps for them it was only a job as well.

The French fell back day after day. They retreated; but, as Sepp had warned, they were not routed. They fell back in good order, taking their weapons. Orders came from the Crown Prince to slow the advance, lest the enemy retreat too fast and escape the encircling First Army, moving down from the north.

Heinrich and his comrades trudged kilometers of endless roads. They heard rumors that the English had landed and other rumors that the English had not entered the war at all. By 28 August they had passed Sedan and their company was pulled off the front for rest and refitting.

Heinrich lay in the shadow of a great elm tree, enjoying the late summer breeze. His boots had been resoled; he had had a leisurely meal; and no one was shooting at him. What soldier could ask for more? He could pretend that the distant crump of artillery was only dry thunder.

He wondered how he would spend the remainder of his leave time. His unit would return to the front tomorrow. The invasion timetable had been carefully calculated, day by day, for each army. But the planner had never walked the route himself; had never had to march and fight and fight and march. The men were growing weary. Heinrich knew he could no longer cover the same distance in a day's march as he could at the beginning. And losses from casualties and garrisoning were narrowing the fronts, opening gaps between columns, so that they zig-zagged their way across the countryside, closing first the left hand gap, then the right.

"Heinrich!" He twisted his neck and saw Georg waving to him. Karl was with him, and some other men he did not know. They came to him, laughing and drinking. "We're going over to see the old battlefield. Do you want to come along?"

Heinrich shrugged. "Why not? Where is Fat Willi? Is he coming, too?"

Karl had a bottle of French wine. He gave it to Heinrich and Heinrich swallowed from it gratefully. The liquid warmed his throat and belly. Karl jerked his thumb over his shoulder. "Willi is having his third serving of cabbage and potatoes. Do not sleep downwind from him tonight, the old pumpernickel."

Heinrich looked at Willi. One of the devil-bats sat on his shoulder and, while

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Willi fed, so did it. He looked away quickly. "Where is the battlefield?" He was anxious to be away. It was the first creature he had seen in several days and he did not want to draw its attention.

The walk to the battlefield of Sedan was not a long one. The terrain had already been turned muddy by the number of boots that had tramped across it. Heinrich, Karl, and the others crowded around the monument. "What does it say?" asked Karl, and Georg translated it for them.

"Isn't that just like the French?" asked someone. "To raise a monument to a defeat?"

"They have few enough victories," said another.

Georg pointed. "Isn't that the hill where the Old Kaiser sat and watched the battle? Yes, and the French General Margueritte's charge came across this way, I think." He waved his arms about, pointing everywhere. The others listened carefully to his description of the long-ago battle; but Heinrich wandered away from them and sat on the hillside where he could see the whole field.

He closed his eyes and tried to imagine what it had been like when the Old Kaiser had crushed Napoleon the Little. Long ago? Why, it was barely forty-four years! Yet, the armies of those days had gone to war in gorgeous plumage and bright colors. There were no machine guns or aeroplanes or barbed wire then. Only the cavalry charge, with cocked lances and helmets bright in the Sun.

His father had been there, in the Bavarian Army; as young then as Heinrich was now. He felt a sudden rush of comradeship with the white-haired, old man, gruff, unemotional, who sat and stared for long hours into the fire. A bond of understanding that stretched between them despite the years, that his older brothers could not share. A world of experience that could be exchanged in a single, knowing look.

"Heinrich!" called Karl.

He looked where the others stood. "What?" He wondered if creatures had fed on the men in the older war. How far back did it go? As far as Old Napoleon? Prince Eugene? Tilly and Wallenstein? As far back as the legends of dæmons?

"We have it figured out! The Bavarians and the Saxons were over there and the Prussians were there." There had been no Reich in those days; just the confederated German armies. Karl pointed energetically to various points of the compass.

Heinrich crossed the field and rejoined them. "Then General Margueritte led his charge across here?" He had just walked in the path of heroes. Perhaps his father had fought on this very ground.

Georg spoke up. "That was when the Old Kaiser said, 'Oh, those brave men!' He said it in French, too. My grandfather told me that, and he was there."

"Brave," said Karl, "but stupid."

"Do you think this war will see anything so grand?" Heinrich asked.

"Heroism is for fools," Karl told him. "The important thing is to stay alive. What did Sedan ever gain the French?"

They began walking back toward their bivouac. "I heard that the people of Paris ate rats during the seige."

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"That's true," said Karl. "I read it in a book. They ate rats, and cats, and shoe leather." He shook his head. "They should have surrendered right off."

Heinrich shrugged. "Maybe it was pride."

"Ah, pride. And envy, lust, and hate. The capital sins," said Karl broadly. "Each of us will be laid low by one of them." He grinned.

"What's that?" asked Heinrich.

"Pay attention, worm! The capital sins. Don't you remember your schooling? There are supposed to be seven, but I only remember four." He nudged Heinrich. "But they are the four most useful."

Georg poked him. "Don't you remember *your* schooling?"

"Greed!" said Heinrich suddenly recalling.

"I was wrong," Karl said. "That is useful, too!"

"And gluttony," added Georg.

"Like Willi," laughed Karl.

"That's still only six," protested Heinrich.

Karl drained his wine bottle and threw it so that it smashed against the Sedan monument. "Who cares? It is only a færie tale told by the priests."

Georg looked wistful. "I studied for the priesthood once."

"Ah, then you should know all about sin."

"Maybe. As much as any sinner." He brightened. "I remember there are three sources of sin!"

"Ahhh!" Karl waved his arm and quickened his pace, leaving Heinrich and Georg behind.

"You've offended him," Heinrich said.

Georg shook his head. "No, he just did not want to be reminded that sin and damnation are real."

"Are they? I think you should have stayed in the priesthood." There was a distant speck in the sky. It caught the Sun and flashed. Perhaps it was a bird; or an aeroplane. Perhaps it was a nightmare. "What are they?" he whispered.

"What are what?"

He had not realized he had spoken aloud. "The three sources of sin," he said, casting the first random thought into his mouth.

"Oh." They walked a few paces further. "The world is one," Georg said. "It provides opportunity. A pretty girl. An unwatched billfold. A careless enemy. Then, the flesh provides weakness. We call that Original Sin. It makes us prey to the temptations of the world. Then, finally: the Devil."

"And what does the Devil do?"

"Why, as we stand there weakening before temptation, the little pumpernickel creeps up behind us and gives us a push."

September followed August as the armies of the right wing marched across northern France. To Heinrich the advance became one weary kilometer after another. He began to wonder if the French would ever make a stand.

His boots were in tatters. The cobbler wagons could no longer keep up with the worn-out footgear. He staggered as he marched, and at night he threw himself to the ground and took a numb sleep by the side of the road.

His companions began to lighten their

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loads by discarding equipment as they marched. Shovels, belts, packs, even extra ammunition. Seeing the litter by the side of the road, Heinrich began to wonder which was the defeated army.

On one particularly long day the captain kept them marching long after sunset. They were behind schedule and keeping the schedule was the most important thing. Sometimes Heinrich wondered whether the war were being run by generals or by timekeepers.

Heinrich slumped down, leaning on his rifle. Sergeants were calling off the platoons and men slipped wearily into the darkness. Heinrich lay back and looked into the night sky. The stars were very clear. There were no clouds. Heinrich tried to pick out the constellations, as he used to in his childhood, but he had forgotten too much and soon gave up.

Karl fell to the earth at his side. The distant rumble of artillery sounded like thunder. "Paris," he whispered. "Soon, Paris. Then all this will be over." He was asleep even as he said it.

Heinrich wanted nothing more than to lie there forever. He could not summon the energy to unbuckle his pack. His feet hurt unbearably. Soon he fell into an uneasy slumber.

His sleep was disturbed by dreams. He dreamed that devil-bats drifted through the night sky, their pale, leathery bodies glimmering in the dark. Their eyes were burning coals, watching, watching. He dreamed that they alighted on the men and pressed their horrid faces to their sleeping bodies. Feeding. Sucking the juices out of them, like vampires.

And he dreamt that one, at last, alighted on him.

With a cry, he sat upright. His heart hammered. He was covered with sweat. He took a slow, deep breath and let it gust out. The back of his neck tingled where the dream-beast had put its mouth. Absently, he scratched it. He turned around.

And the red smoky eyes were staring at him.

He cried again; but it was no more than a whimper that escaped his throat. The creature sat on its haunches no more than three feet from him. Its arms and wings were folded and its head was cocked a little to one side. Heinrich turned away quickly. "It wasn't a dream," he whispered.

It was not.

Heinrich's head jerked. Voices in his head. Was he going mad?

Not mad; not yet. It was a voice, yet not a voice, sounding sardonic, amused. He shook his head wildly. Is it so humorous to go mad? Is the mind's last rational act to laugh at its own fate?

The sound of dried leaves in his ears. Was the creature coming closer? Heinrich rolled away, bumping into Karl as he did so. Karl stirred but did not awaken.

Am I so repulsive, then? Amusement. *Consider how you appear to me. Swollen, lumbering, moist.*

Heinrich did not look back. His mind was out of gear. There was terror in it, locked away somewhere, spinning furiously but producing no motion. He felt as if he were watching himself from afar. "What are you?" he croaked.

What am I? Cobwebs tickled his brain. In a convulsive gesture, Heinrich

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ran his hand through his hair. *There are no words for what I am.*

"Not dæmon? Not monster?"

Laughter. *In my own eyes?*

Steeling himself, Heinrich turned. The creature's eyes burned and boiled like lava. They held him transfixed. They seemed to roil in constant motion.

"Are you speaking to me?"

If you choose to believe so.

"But . . . how?" Heinrich held his hands to his ears, blotting out all sound; but the voice echoed clear and true.

How? Puzzlement. *It is as it is.*

There was silence in his mind, and Heinrich took his hands from his ears. "Do you truly exist? Are you real?" Can one ask a nightmare if it is real? How would the nightmare answer? Is the ultimate horror a lie—or the truth? *Yes, I am real?* Terrifying. Unbearable. *No, I am not?* Bearable; but only in the oblivion of madness. And yet the reply, when it came, was an unexpected one.

How is it you can see me when no others can?

Now Heinrich was puzzled. Could one debate a dream? "I was wounded in a battle. I saw you there." Images of fear-crazed soldier charging. The man he had impaled, gushing his life's blood onto Heinrich, legs kicking, sightless eyes staring at him. The cathedral of corpses sculpted by machine gun on massed bayonet charge. The convulsive jerk of the bodies as the captain fired into their temples. He covered his face with his hands. "I saw scores of you. Whatever you are."

Call us refugees.

"Refugees." Heinrich spoke the word aloud. Vision of uprooted peasants fleeing the plundering armies. "Refugees. From where? From what?"

There was a struggle. We lost. It was an eon ago, and even Time forgets. We are here; but once we were there.

Heinrich turned and saw that the creature had turned its lava eyes to the sky. A clawed hand thrust toward the star-filled heavens. Heinrich felt a shiver run through him. He followed the direction of the arm out into the blackness of the night. Stars twinkled coldly in the sky.

I do not know which one was ours. That, too, has been forgotten.

Heinrich sat silently. He craned his neck to watch the stars. The Milky Way was a slash through the velvet night. What a God-awful distance to fall.

"Thrown down from Heaven, were you? Then this must, indeed, be Hell." Hell? Perhaps. He had seen suffering enough for a dozen hells.

I had thought that one of your kind had become aware. A sense from time to time that someone was watching. A foreboding. A . . .

A haunting?"

Yes. It frightened me.

Heinrich turned and stared at the devil-bat. "*You?* You were frightened?" He nearly giggled. In his mind, Heinrich saw the devil-bats: on the French soldier screaming his hate as he charged; riding the captain and the officers at the medal ceremony; squirming with Sepp and the woman in a travesty of love. Flocks of devil-bats swarming in the sky. "You were frightened?"

He swung his fist at the devil-bat and his arm passed through the image as if through smoke. The punch carried Heinrich to the ground, and he lay prone, with his face pressed into the

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dirt. "Oh, God. I'm mad. I'm going mad." He looked up at where the creature sat perched upon a rock. "You're a devil, come to destroy me. You are hungry so you stir up our passions and then you feed upon them!"

Would you have us starve to please your sensibilities?

The dæmon-filled battlefield skies . . . The rotting corpses . . . "Yes," he whispered. "Oh, yes."

Dæmon-filled? You see what you want to see. Do not charge this slaughter to us. You nurtured it. You suckled it. Who marched away to music and lovers' kisses? No, we reap where we did not sow.

Ah, and if not the Devil, who sowed Cædmon's teeth? Heinrich no longer knew if his mind gibbered to itself or if he sat in the hight and conversed with a dæmon. It did not matter. Nothing mattered anymore.

The creature's ghastly countenance filled his vision. *Despair,* it seemed to say, *is most delicious.* And it applied its mouth to him.

The next day was the Battle of the Marne. And there were some among the allied soldiers who, in those desperate hours, saw golden-eyed angels in flowing white robes hovering over the field. ■

NUCLEAR SPRING

—Arlan Andrews

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The Sagan Space Research Institute sat in the middle of the Arizona desert on a parcel of land that was good for observing astronomical phenomena and precious little else. The observatory dome, high on its artificial hill, had a commanding view of the surrounding plateau, which meant that it had a commanding view of exactly nothing.

The drive to the Institute from the town that shared its name was an uninspiring one, unless you were inspired by tumbleweeds and twists of yucca. Consequently, changes in the austere landscape were easily noticeable, even this close to sunset.

"What the hell is that?"

Dr. James Dunegan pulled his eyes from the griddle-flat stretch of road that led to the Sag (as it was affectionately known), and glanced at his companion.

"What the hell is what?"

"That."

Jim slowed the car and peered out the front window past Akio Ozawa's pointing finger. "That" was a shiny metal building with a curving roof, sitting in isolated splendor on the parcel of land right next door to the Institute.

"It's a Quonset hut," said Jim, shrugging.

"It wasn't there Friday."

"Squatters, maybe."

"Fast squatters . . . There's a sign," Akio noticed as they drew abreast of the building. "Universal Land Management," he read. "Geez! They've got to be kidding!"

Jim laughed. "You know what they say, Ki. There's a sucker born every minute. We're probably looking at the future sight of the latest and greatest in retirement villages."

"Oh, yeah. For people who've always wanted to retire to Mars, but couldn't make the shuttle team."

On the rear deck of the Quonset hut, Sal Pal stood and surveyed the surrounding countryside. A lot with a view.

He grinned and gazed up into the endless sky, rubbing his hands together. His client would be here at any moment to close the deal. The Deal of the Millennium, as far as Sal was concerned. After this one, he could retire to some nice little garden spot and complete his family.

He spent a moment fantasizing about that eventuality, then went inside to wait for his client.

"All set?" Akio Ozawa peered over his partner's shoulder at the computer display.

"All set. We start recording the eclipse at 1900 hours and thirty-seven minutes. Even if we're late for work tomorrow night, Uncle Carl will start taking pictures without us."

Akio straightened and checked his wristwatch against the computer clock. "Ain't technology grand . . . ? How 'bout some dinner?"

Jim quirked an eyebrow at him. "You buying?"

The calibration on the telescope was complete before midnight, and the two astronomers drove to a favorite all-night eatery in Sagan, passing the Universal Quonset on the way.

"Will you look at that?" Akio jerked

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his head at it. "Our friend seems to have bagged a pigeon."

"Huh?" Jim squinted across the moonlit sand.

"There's a big ol' limo outside the hut."

"Oh, yeah. I see it. Monster thing, isn't it?"

As they drew level with the Universal signboard, two figures emerged from the metal building out onto the silver plain.

"God-*zilla!*" Akio coughed. "That one guy would *need* a limo that big just to handle his *weight!* I hope he's not the buyer, or that little guy is going to be in a real jam when he finds out how worthless this hunk of land is."

Jim's eyebrows shot upward as he caught a glimpse of the rotund figure towering over the tiny one next to it. "*In* a jam? You mean, he's going to *be* jam! Woof! I wonder who our new neighbor is going to be?"

"I think I was right the first time —Godzilla."

"Well, my friend? What do you think?" Sal Pal's smile was pleasant and ingenuous.

His large companion surveyed the property with the eye of an aesthete. He nodded. (Or at least Sal thought he did. With someone like Iskar Drootz, it was hard to tell.) "Yes," he said sonorously, the tones rolling around his massive chest like bearings in a bass drum. "Yes, it is quite stunning. Quite. I am pleased."

He took a deep breath of the desert air. It rattled the purifier element in his filtration mask, making Sal think of the snake he'd been forced to kill that morning.

Drootz faced him, gazing down from his immense height, over his immense girth with huge watery eyes. "We have a deal." He held out his hand.

Sal took it firmly and waggled it from side to side, then up and down and around in rhythmic ceremony.

"You have a firm grip for a man-being with only one thumb," commented Drootz. "It makes you seem quite trustworthy."

Sal let his eyes flicker wide open in glittering, black innocence. "But, my dear Iskar!" he objected. "I am completely trustworthy. The property is yours. You may take possession of it immediately."

"Excellent. My crews will be right on schedule."

Moments later Sal Pal was counting his profits and wondering if he could scare up another of those delectable reptiles for dinner.

Akio Ozawa gazed through the tinted window of Jim Dunegan's Honda and realized that he thoroughly enjoyed their late afternoon drives to work. The broiled desert, with its garnish of stunted greenery (if you could call it greenery) had a strange beauty at this time of day. The vermilion hues of sunset wrapped themselves around the deepening shadows of sandy tussocks and twisted growth in lovely, bizarre forms reminiscent of a Martian landscape.

He took a deep breath of the warm, dry air that rushed through the window into his face and let his eyes wander ahead to where the Sag sat like a beached space station on the plateau.

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"I sure hope that development isn't going to be one of those big, ugly, sprawling 'burbs that end up looking like a prefab precancerous growth."

Jim chuckled. "Hey, it'll probably be one of those amusement parks with the big Matterhorn rides. They'll import snow, trees . . . water."

"Maybe we can find out." Akio sat forward in his seat. "There's that little guy from last night. Looks like he's pulling up stakes."

Jim slowed the car, curious. "That was fast. He's only been here four days, max."

"We could stop and be nosy neighbors."

Jim shrugged and pulled the car in front of where the little real estate agent was struggling with a signboard that was easily three times his size.

Akio was the first one out of the car. "Hi! Need a hand?"

The man stopped struggling and blinked at him blankly. "A . . . Oh!" He laughed. "A hand! Yes, yes, I suppose I do."

With all three of them pulling and prodding, the placard was quickly dispatched and they stood smiling at each other.

"Thank you much," said the real estate man, nodding.

"You're welcome," said Jim, nodding in return.

"So," said Akio, after a moment of silent nodding. "I guess this means you sold the property."

The real estate agent's odd, pupiless eyes slid quickly over both their faces. He smiled. It was a very pleasant, ingenuous smile. "Yes, yes. As you say, I sold the property. A very big sale. Very big."

"Yeah? How many acres?"

"Acres? Oh, very many acres."

"So." Akio surveyed the parcel. "What are they going to do with it?"

"Do with it?" The blank look popped back, faded toward wariness, then disappeared in a grin. "Oh, a resort. You know. Playground for the rich."

"Well, I hope they don't ruin the landscape."

"Oh, no! I don't think they will do *that*. They want it to . . . retain its . . . primitive quality—its natural beauty."

"That's good to hear. Uh, could you tell us who 'they' are?"

The black, bottomless eyes flickered skyward, then came back to rest on the Universal signboard. "Oh, big development company. Foreigners, though. You would not have heard of them —Drootz Limited." He shrugged.

"No, I guess not," said Akio. "Well, anyway, it's good to know it's not going to be some big ugly industrial complex."

"No, no, my friends. Nothing of the sort. . . . By the way, let me introduce. I am Sal Pal." He held out his hand.

Akio took it and shook it firmly up and down. "I'm Akio Ozawa."

"Jim Dunegan," said Jim, shaking the proffered hand. "We're on staff at the Sagan Space Institute next door there. We're on our way to work." He glanced pointedly at Akio, who ignored him.

"Space Institute, yes!" Sal's eyes became enormous. "Such interesting work. But you keep odd hours. Don't most folks here work in daylight?"

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"Not if they want to catch an evening lunar eclipse," said Jim. "Which we *do*." He gave Akio another meaningful glance.

"Yeah, we'd better blow if we're gonna make moonrise. Nice meeting you, Sal."

Once the two scientists were back in their car, he could contain himself no longer, but burst into a series of wheezing, hiccuping guffaws. It was true what they said here, there was a sucker born every minute.

"Sal Pal!" chuckled Akio. "What a great name for a con man!"

"How do you know he's a con man?" asked Jim. "And get your damn feet off the console! Geez, Ki. The damn thing cost the Institute an arm and a leg."

Akio dropped his feet to the floor, neatly avoiding spilling his coffee. "Oh, he's a con all right. He was laughing all the way back to his office. . . . and from there to the bank, I'll bet. Whoever bought that hunk of sand probably thinks there's water on it. Or something even more valuable."

"He said it was going to be a resort."

"And you believed him? C'mon, Jim. Wise up."

Jim parked himself at his own console and sipped thoughtfully at his coffee. "Where do you suppose he was from? He had a real interesting accent."

Akio shrugged. "Sounded kind of Indian to me. Middle Eastern, maybe."

Jim nodded. "Coming up on 1937." He switched his display to the view provided by the smaller of the Sag's two telescopes.

Akio was already patched in. "There she goes." He gave the screen a cursory glance, watched the chronometer begin counting elapsed time, and stood up to stretch.

"You're not going to watch?" asked Jim almost irritably.

"You've seen one eclipse, you've seen 'em all. Besides, this one's only a partial . . . Hey, Soos! What's happening in the real world?"

Dr. Susan Lefkowitz hovered in the doorway, looking flushed and harried. "Funny you should ask. While you gentlemen have been in here stargazing, the desert's been crawling with gendarmes."

"Excuse me?" said Jim.

"Police and Sagan Security. All over the neighboring sand paddy. It seems somebody decided to shoot off an illegal fireworks display. The place lit up like a king-sized Roman candle."

"No shit," said Akio. "That place was just sold today. Maybe our pal Sal decided to celebrate. Did they catch him?"

"No. There was no one there. Just a burned-off spot where they set off the fireworks. And what do you mean it sold? It can't have sold, it belongs to the US government."

Akio and Jim both stared.

"It does?" asked Jim.

Akio doubled over, shaking. He laughed until his eyes watered. Jim just shook his head bemusedly and Susan frowned at them.

"What?" she asked finally. "What is it?"

Since his partner seemed incapable of speech, Jim attempted an answer. "Did you notice that little Quonset hut out there on the way in from town?"

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Susan nodded slowly. "You mean where the fireworks went off? Sure. It looked more like a double-wide travel trailer to me, but I noticed it."

"Universal Land Management, the sign said. It was run by a guy named Sal Pal. We met him this afternoon."

"Oh," said Susan. "I didn't see the sign." Her eyes got huge. "Oh, you mean this guy *sold* that land to somebody?"

"Well," chortled Akio, finding his voice. "Let's say somebody *thinks* he did."

"That's dishonest."

Akio grimaced. Nice lady, Susan Lefkowitz, but she had no sense of humor. "Of *course* it's dishonest. The guy was a con artist. He sold property he didn't own to some big developer —probably for a bundle—threw a party, and split with the proceeds. Holy Moses, I'd love to see the look on the developer's face when he finds out he's been taken to the cleaners."

Susan shook her head. "Not me. I hate things like that. And I certainly *don't* think it's funny." She threw Akio a reproving glare. "By the way, *doctors*, aren't you supposed to be monitoring Uncle Carl?"

Jim blinked guiltily. "Oh, yeah." He swiveled back to his console. The display showed a full moon that looked like a white chocolate cookie with a tiny nibble taken from it. "We're at 5 percent."

"Honestly, Lefkowitz," Akio complained, "you have absolutely no sense of humor."

"Honestly, Ozawa," returned Susan, "you have no sense of honor. . . . Is there anything you can tell the police about this Pal person?"

Akio shrugged. "I could give them a description, I suppose."

"How about a license plate number or something?"

"I didn't see his car. Saw the one his client was driving, though." He waggled his hand as if he's just burned it. "Hot stuff! Big ol' limo."

"Maybe you should talk to them, Akio," said Susan, looking very concerned. "I don't think anyone else even noticed the real estate sign. And I'm sure no one else *met* this guy."

Akio had the good grace to look a little guilty. "Well, yeah. Maybe you're right. He just seemed like such a nice guy. I'd hate to sic the authorities on him."

"Nice guy? Akio Ozawa! He was selling government land to—to an innocent victim. That's like—like selling stolen property!"

"I don't know how innocent his victim was," Akio objected. "And the property isn't exactly *stolen*. I mean, it's still there. It's not like he picked it up and *moved* it."

"The point is," said Susan, "that somebody is probably out thousands or even millions of dollars right now because of this 'nice guy.' Really, Akio, you've *got* to talk to the police. They're in the Asimov. Come with me?"

Akio grimaced. "Can it wait till after the eclipse?"

"No, it can't." Susan glared at him again. "I think you need to talk to them. *Both* of you. I think Professor Cheslitt would insist on it."

He sighed. Next she'd start tapping her foot. He hated it when she tapped

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her foot. Especially when she was wearing a lab coat and those little, tiny, spiky-heeled shoes and carrying a clipboard under her arm. She looked like a militant nurse getting ready to attack him with a rectal thermometer. He glanced at Jim, but there was no support coming from that quarter. Jim was gazing at him soulfully, a lock of blond hair falling forlornly over his right eye.

He surrendered. "OK, OK. We'll go."

Susan smiled and crooked her finger at them. "C'mon, boys. I'm sure Uncle Carl can handle the videotaping himself. Besides—" Her eyes got suddenly wicked. "—you've seen one eclipse, you've seen 'em all."

Akio grimaced. She would have to overhear that. He stood and straightened his lab coat, tacked on an affable smile, and fell into line behind Susan and Jim.

The two officers seated at the long oak table in the Asimov Conference Room had just finished interviewing one of the senior systems analysts. They looked definitely frustrated (or maybe they were just bored).

Susan Lefkowitz introduced her fellow scientists, then seated herself to watch the proceedings.

"I'm Sergeant Ramirez," the older of the two men introduced himself. "And this is Sergeant Cole. Dr. Lefkowitz says you gentlemen might have some information about the alleged vandal."

"Well, uh, we might have met him. I mean, we met a guy that *might* be the vandal. A real estate agent set up shop over there." He nodded out the door.

"On the property next to the Institute?"

Akio nodded. "Yes, sir. Gave the name Sal Pal. From Universal Land Management—or so his sign said. I suppose you'd like a description?"

Sergeant Ramirez smiled and nodded.

"He was short, thin, dark-eyed, dark-haired. Spoke with an accent that might have been Indian—East Indian, I mean. . . . Excuse me, but aren't you going to take any notes?"

Sergeant Cole held up a micro-disk recorder. "Welcome to the Space Age," he said.

"Did you see what kind of car he drove?" asked Ramirez. "We couldn't find a single tire track over there."

"I didn't see his car. But his client had this great big ol' limousine. One of those stretch jobs."

"His client?"

Akio fidgeted, feeling like an informant on Dragnet. "Well, that's just sort of an assumption we made, really. He *could* have been the guy's brother-in-law for all we know. But, when he said he'd sold the property . . ." He shrugged, embarrassed, and wished Jim would say something.

Jim did say something. He said a lot of somethings. It seems he'd noticed all sorts of tiny details about Sal Pal that Sherlock Holmes would have probably yawned at, and he shared each and every one of them with the police so *they* could yawn at them.

Over an hour later, they were finally on their way back to the lab. Jim looked like he'd just earned a medal of valor.

"An emerald in his *bicuspid?*" whined Akio. "You thought he had an emerald in his damn *tooth?* It was probably a piece of spinach left over from lunch."

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Jim shook his head emphatically. "No. Spinach doesn't glitter. It was an emerald. . . . Although . . . I suppose it could have been peridot," he added thoughtfully.

"Yeah, or moon rock," Akio grumbled. "I need coffee." he shoved through the lab doors and went to snatch up his coffee cup, giving the monitor a cursory glance. "How're we doing?"

Jim wandered over to check his console. "Seventy-five percent. That's the max."

Akio grunted unintelligibly. "Want some coffee?"

"Yeah, sure." Jim stuck his hands in the pockets of his lab coat and frowned at the monitor. "Should I tell the cops?"

"Tell them what?"

"That it could have been peridot."

"Geez!" Akio dove through the doors and headed for the staff lounge. On his way back with the coffee, he bumped into Susan Lefkowitz just outside the lab.

She was smiling. No, she was grinning. "The police are very impressed with your buddy," she said. "He's a regular Miss Marple, isn't he?"

"Miss Who?"

"Marple . . . You know, Agatha Christie? Well, anyway—I couldn't *believe* that bit about the jewel in the guy's *tooth*."

"I still say it was spinach," grumbled Akio and gave her a squinty glare. "Is chivalry dead or just sexist?"

"What?"

"The doors?" He jerked his head at them and sloshed the coffee.

"Oh! Sure!" She gave the doors a light push, then jumped three feet when a wild yelp sliced through the gap between them.

"Damn!" Ignoring the hot coffee that slopped onto his wrists, Akio shouldered his way into the lab.

"*What the hell?*" Jim Dunegan sat staring at his console as if it had just propositioned him. Before either Akio or Susan could do more than stare at him, he'd swiveled to his keyboard and begun punching at it with fierce little jabs.

"Jim?" Akio set down the coffee and moved to the tracking console.

"Ki, look at this!"

Frowning, Akio peered over his shoulder. What he saw didn't make sense at first. "I don't get it. I thought I heard you say 75 percent."

"I *did*. I did say 75 percent!" Jim looked like panic going somewhere to happen.

Susan joined Akio at his shoulder. "Did you get the data wrong? Maybe it was supposed to be a total."

"No, dammit. No! It's a *partial* A three-quarters eclipse, not a total."

"It's pushing total now," noted Akio superfluously.

"I can *see* that!" Jim snapped.

"But that's impossible! That shouldn't happen."

Jims shot him a baleful glare. "Tell me something I don't know."

"I'm going for Dr. Cheslitt," decided Susan. She bolted from the room.

"Maybe we goofed," suggested Akio, after a long, strained silence. The white chocolate cookie was now just a crust.

"Oh, sure!" Jim nodded fiercely. "Sure, Ki. You and I and Cheslitt and every other astronomer world-wide goofed and calculated a partial eclipse

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instead of a total. Or maybe God just decided to give the laws of nature a day off. Give me a break!''

''Well, then what?'' asked Akio, dropping numbly into his chair. ''The—Moon is being eaten by a giant rat? The Earth is swinging out of orbit?''

''Or the Moon is,'' said Cheslitt's voice from behind them. He came to stare at the display, looking incredibly grim. ''Every other observatory in the sight zone is reporting the same phenomena. We have,'' he paused and sighed, Basset-eyed, ''a total eclipse.''

The white chocolate crust was gone.

''Oops,'' said Akio.

Jim shook his head, fanning his nose with his recalcitrant forelock. ''I don't get it. Professor Cheslitt, how on God's green Earth could the entire scientific community have been wrong about something as mundane as an eclipse?''

''I don't know,'' admitted Cheslitt. ''But we obviously *were*.''

''There go the grants,'' muttered Susan.

The building shook, jarring them from their semitrance.

''What was that?'' Cheslitt frowned at the double doors which swung slightly on their well-oiled hinges.

''I'll check.'' Susan Lefkowitz disappeared through them. When she returned five minutes later, the three men were still frozen around the console. Their eyes hadn't left the computer display.

''Come on, come *on*,'' Jim murmured impatiently.

''They say it was an Earth tremor,'' Susan announced nervously. The building shivered as if to underscore her words.

Akio strained forward in his seat, staring at the dark, square plate of sky.

''And there's a hell of a wind storm whooping it up outside—''

''Come *on!*'' said Jim again—loudly this time.

Akio realized he was holding his breath. He exhaled forcefully. ''Where is it? It should be showing by now.''

''Dear God,'' said Cheslitt.

Susan didn't want to look at the monitor. She looked at Cheslitt's face, instead. It wasn't a comforting sight. ''What is it? What's happening?''

''The Moon . . . '' said Akio and halted. ''The Moon—what?

''It's still dark,'' said Cheslitt, half to himself.

''Dark!'' snarled Jim. ''It's *gone!* The Moon is *gone!*''

In the silence, the building shivered again like chilled Jell-o.

''Oh, said Susan weakly. ''I guess we'd better call the Weather Bureau.''

Sal Pal put his factory-new Rasomega on auto-pilot and stretched out in the plush driver's seat. Ah, the smell of a new space craft! There wasn't another aroma in the cosmos quite like it.

Reaching over to pat his money bag, he smiled and thought of Vara and their two offspring, now waiting for him on Ford's Planet. With this haul, he and Vara could incubate the children and relocate to that pretty little planetoid in the Galactic Heart.

He pulled the brochure out of his inside pocket. The inner fold-out showed a sky so full of stars that moons would be redundant (if there were any moons.)

He emitted a wheezy chuckle and refolded the brochure. It was a funny thing

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about moons. In one part of the Galaxy they were superfluous, in another, they were a status symbol.

He'd made a point of taking Vara and the kids by Peloo to see the fine set of satellites they'd amassed over the last several hundred years. They had nine now, counting the latest addition, and could be smug in their clear superiority. . . until Barca's World scored another moon or two.

The media was calling it the "Lunar Wars" and delighted in throwing the tourist trade this way or that, depending on who'd just one-upped whom. Well, it'd be years before Barca's World could afford to purchase any new moons and Sal Pal would be safely retired by then. . . . probably in Phat City, definitely in no need of money. . . .

Of course, Frooda was making noises about acquiring some additional satellites now. They had a good start already—four nice, natural moons of their own (if you could count that misshapen spud of an asteroid that had the inner orbit).

Sal shook his head and wondered if he'd ever really be able to retire. Once the Trade got into your blood, it was hard to get it out. Still, he'd at least make a show of retirement—give it, oh, five hundred years or so—see how he liked it. If it didn't work out, he could always go back into the Business.

Who knew? Maybe this moon madness would spread down the Spiral Arm. At the very least, given another five hundred years or so, the Earth folk would develop some legitimate form of space travel. And it was a sure bet they'd be in the market for a moon. ■

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The Alternate View

EINSTEIN'S SPOOKS AND BELL'S THEOREM

John G. Cramer

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Albert Einstein disliked quantum mechanics, the physical theory that deals with matter and energy at the smallest possible scale. Quantum mechanics, as developed by Heisenberg, Schrödinger, Dirac, and others, had many strange features that ran head-on into Einstein's finely honed intuition and understanding of how a proper universe *ought* to operate. Over the years he developed a list of objections to the various peculiarities of quantum mechanics. At the top of Einstein's list of complaints was what he called "spooky actions at a distance."

Einstein's "spookiness" is now called *nonlocality*, the mysterious ability of nature to enforce correlations between separated parts of a quantum system that are out of speed-of-light contact, to reach faster-than-light across vast spatial distances or even across time itself to ensure that the parts of a quantum system are made to match. This column is about nonlocality, and how, through Bell's theorem, the nonlocality implicit in nature has been demonstrated in the laboratory.

In 1935 Einstein, with his collaborators Boris Podolsky and Nathan Rosen, published his list of objections to quantum mechanics in what has come to be known as "the EPR paper." The EPR paper listed three main complaints against quantum mechanics, one of which was nonlocality. They argued that "no real change" could take place in one system as a result of a measurement performed on a distant second system, as quantum mechanics required. Einstein and his colleagues also found it unacceptable that in quantum mechanics the measurement of one variable often precludes any knowledge of a second "complementary" variable (for example momentum and position). They further objected to the intrinsic randomness and non-predictivity of quantum mechanics. They argued that the theory must be incomplete, and that it must eventually be replaced by a superior and more complete theory which would observe light's speed limits, would allow all physical quantities to have well-defined values, and would permit accurate prediction of the outcome of any quantum event.

A slow-motion uproar followed the publication of the EPR paper. The founders of quantum mechanics immediately tried to come to grips with the EPR criticisms. Niels Bohr focused this debate on the second of the EPR objections, the simultaneous "reality" of complementary variables like momentum and position. The arguments over this intellectual battleground washed back and forth for the next 30 years. During this ongoing controversy, EPR supporter David Bohm introduced the notion of a "local hidden variable" theory, a partially formulated theory that would replace quantum mechanics with a theoretical structure omitting the para-

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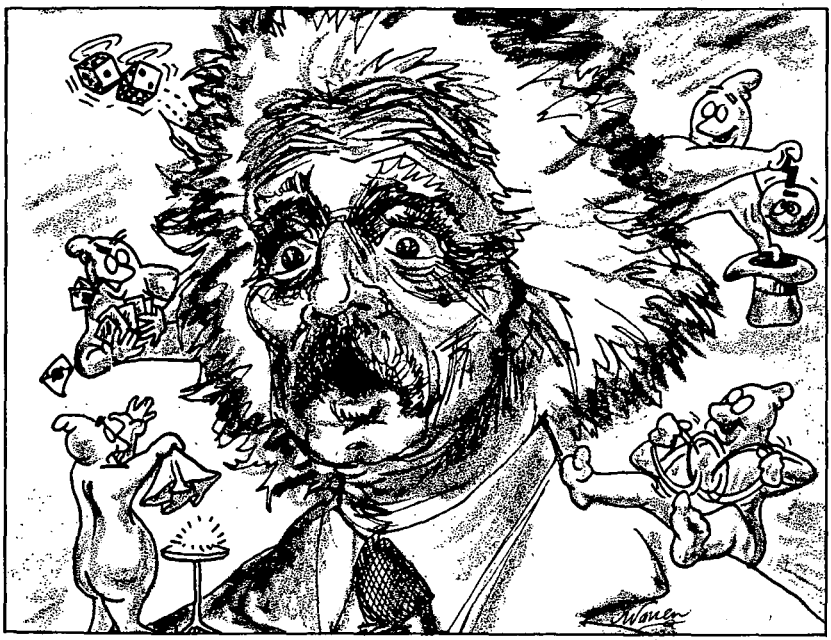

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doxical features of quantum mechanics to which the EPR paper had objected. In Bohm's hidden-variable alternative to quantum mechanics, all correlations were established locally at sub-light speed. Position and momentum were permitted to have simultaneous values, values that were real, but were "hidden" and inaccessible to direct measurement.

Working physicists, however, paid little attention to hidden-variable theories. Bohm's approach was far less useful than quantum mechanics for calculating the behavior of physical systems. Since it was apparently impossible to resolve the EPR/hidden-variable debate by performing an experiment, physicists tended to ignore the whole controversy. They continued to use and improve quantum mechanics without agonizing over whether there were underlying problems gnawing at the roots of the theory. The EPR objections were considered problems for philosophers, not real physicists.

Then, in 1964, this perception changed. John S. Bell, a theoretical physicist working at the CERN laboratory in Geneva, proved an amazing theorem which demonstrated that certain experimental tests could distinguish the predictions of quantum mechanics from those of any local hidden-variable theory. Bell, following the lead of David Bohm, had based his calculations not on measurements of position and momentum, the focus of Einstein's arguments, but on measurements of the states of *polarization* of photons of

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light.

Before discussing Bell's theorem further, we should pause to develop some background on the polarization of light. What we refer to as visible light, infrared or ultraviolet rays, radio waves, X-rays, or gamma rays are all aspects of the same phenomenon. They are traveling waves produced when electric and magnetic fields vibrate together at right angles to each other as they move through space at the speed of light. The direction in which the electric field of a light wave vibrates determines the *polarization* of the wave. If the electric field vibrates always in the same plane, we say that this is the plane of polarization of the wave, and that the wave has *linear polarization* in that plane. If the electric field vibrates so as to trace out a "corkscrew," a right-or-left handed helix, as it travels through space, we say that the wave has left or right *circular polarization*. For the present discussion we will concern ourselves only with linear polarization and will use the term *polarization* always to mean linear polarization.

It is quite easy to measure polarization of visible light. Special optical filters, for example the lenses of Polaroid™ sunglasses, absorb light polarized in one direction while transmitting the light polarized in the perpendicular direction. There are also polarization-sensitive splitters (Nichol prisms) that will divide a beam of light into two beams, one, for example, with vertical polarization and the other with horizontal polarization.

Using such devices, light can be divided into two polarization components. For example, light polarized at some angle to the vertical can be split into a vertical and a horizontal polarization component. Similarly, both vertically and horizontally polarized light can be split into $+45°$ and $-45°$ components of equal intensity. If a beam of unpolarized light is passed first through one polarization filter and then another, the intensity of the transmitted beam varies in accordance with Malus' Law, which states that the intensity $I(\Theta)$ is proportional to the square of the cosine of the angle Θ between the polarization direction of the first filter and the second filter, i.e., $I(\Theta) = I_0 \mathrm{Cos}^2(\Theta)$, where I_0 is the intensity when the filters are parallel. Thus, when the planes of polarization of the two filters make a right angle, the crossed filters look black and no light is transmitted. When the planes of polarization make an angle of 45°, half the light is transmitted.

In an atom, if an orbital electron is kicked into a higher orbit by an energetic photon or an electrical discharge, the electron returns to its lowest energy state by a process called a *cascade*, a series of quantum jumps to lower orbits, each jump producing a single light photon of a particular wavelength. A two-photon cascade in which the atom as a whole begins and ends with no net rotational motion is of particular interest, because the cascade produces a pair of photons which have *correlated polarizations*. When the photons from the cascade travel in opposite directions, the no-rotation restriction requires that if one of the photons is measured to have any definite polarization state, the other photon is required by quantum mechanics to have exactly the same polarization state. Experimental tests of Bell's theo-

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rem, sometimes called EPR experiments, employ a pair of oppositely directed polarized photons from such a cascade.

EPR experiments measure the coincident arrival of two such photons at opposite ends of the apparatus, as detected by quantum-sensitive photomultiplier tubes after each photon has passed through a polarizing filter. The photomultipliers at opposite ends of the apparatus produce electrical pulses which, when they occur at the same time, are recorded as a "coincidence" or two photon event. The rate of such coincident events when the polarization directions of the two filters have the values Θ_1 and Θ_2 is measured. Then one or both of the angles are changed and the rate measurement is repeated, until a complete map of rate vs angles is developed.

Bell's theorem deals with the way in which the coincidence rate of an EPR experiment falls off when the two polarizing angles Θ_1 and Θ_2 are not equal. Bell proved mathematically that for all local hidden-variable theories, the decrease in the coincidence rate must be linear (or less) with the angular difference between the two filters. Suppose, for example, that we misalign the angles of the two polarization filters so that the angle between the polarization directions of the two filters is $\Theta = \Theta_1 - \Theta_2$. We measure the coincidence rate $R(\Theta)$, as compared to the rate R_o when the filters are perfectly aligned. That rate drops by an amount $\Delta_1 = R_o - R(\Theta)$. Now we double the amount of the misalignment, so that the decrease in rate is $\Delta_2 = R_o - R(2\Theta)$. For this situation, Bell's theorem requires that Δ_2 must be less than or equal to twice Δ_1 ($\Delta_2 \leq 2\Delta_1$).

This prediction of Bell's theorem is one of the so-called "Bell inequalities." It can be thought of in the following way. Consider that the coincidence rate R_o when the polarizing filters are aligned ($\Theta = 0$) is a "signal," to which "noise" is added when a misalignment is introduced. If the "noise" Δ_1 introduced by moving one filter an amount Θ to the right is not correlated with the "noise" Δ_1 introduced by moving the other filter by the same angle to the left, then at most, when both sources of noise are present, the noise Δ_2 from a 2Θ misalignment should be twice Δ_1. However, the two uncorrelated noise sources may occasionally cancel, permitting Δ_2 to be less than twice Δ_1. Therefore, this Bell inequality states that Δ_2 must be less than or equal to twice Δ_1.

Quantum mechanics, on the other hand, predicts that the coincidence rate $R(\Theta_1, \Theta_2)$ depends only on the relative angle $\Theta = \Theta_1 - \Theta_2$ between the two polarization directions, and that $R(\Theta)$ obeys Malus' Law. In other words, quantum mechanics predicts that $R(\Theta_1, \Theta_2) = R(\Theta) = R_o \mathrm{Cos}^2(\Theta)$. Therefore, $\Delta_1 = R_o[1 - \mathrm{Cos}^2(\Theta)]$ and $\Delta_2 = R_o[1 - \mathrm{Cos}^2(2\Theta)]$. When the misalignment angle Θ is fairly small, this means that Δ_2 is about four times Δ_1 and clearly much larger than twice Δ_1 (i.e., $\Delta_2 \sim \Delta 4.\Delta_1 > 2.\Delta_1$). This is a clear violation of Bell's theorem because the coincidence rate, as predicted by quantum mechanics, falls off much too fast with increasing angle to be consistent with Bell's theorem, which predicts an approximately linear decrease.

When two theories make such distinctly different predictions about out-

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come of the same experiement, a measurement can be performed to test them. For quantum mechanics and Bell's theorem this crucial EPR experiment has now been performed a number of times. And we find that quantum mechanics always wins. The EPR experiments demonstrate very significant violations of the Bell inequalities while confirming the predictions of quantum mechanics.

When the first experimental results from EPR experiments became available, they were interpreted as a demonstration that hidden-variable theories must be wrong. This interpretation changed when it was realized that Bell's theorem assumed a *local* hidden-variable theory, and that *nonlocal* hidden-variable theories can also violate Bell's theorem and agree with the experimental measurements. The assumption made by Bell that had been put to the test was the assumption of *locality*, not hidden variables. Locality was in conflict with experiment.

Or, to put it another way, the intrinsic nonlocality of quantum mechanics has been demonstrated by the experimental tests of Bell's theorem. It has been experimentally demonstrated that nature arranges the correlations between the polarization of the two photons by some faster-than-light mechanism that violates Einstein's intuitions about the intrinsic locality of all natural processes. What Einstein called "spooky actions at a distance" are an important part of the way nature works at the quantum level. Einstein's faster-than-light spooks cannot be ignored.

Readers and writers of science fiction will want to know what the nonlocality of nature means for faster-than-light travel and faster-than-light communication. Can we harness Einstein's spooks to drive our spaceships and carry our messages? The answer, alas, seems to be no. Very clever people have tried to exploit the seeming loophole in the lightspeed barrier implied by nonlocality to design superluminal communication devices. See, for example, my column "Paradoxes and FTL Communication" (*Analog*, Sept. '88). In every case, including the Calcutta scheme mentioned in that article, these have been shown to be unworkable. Nature seems to have reserved her faster-than-light telephone line for her own private conversations. ■

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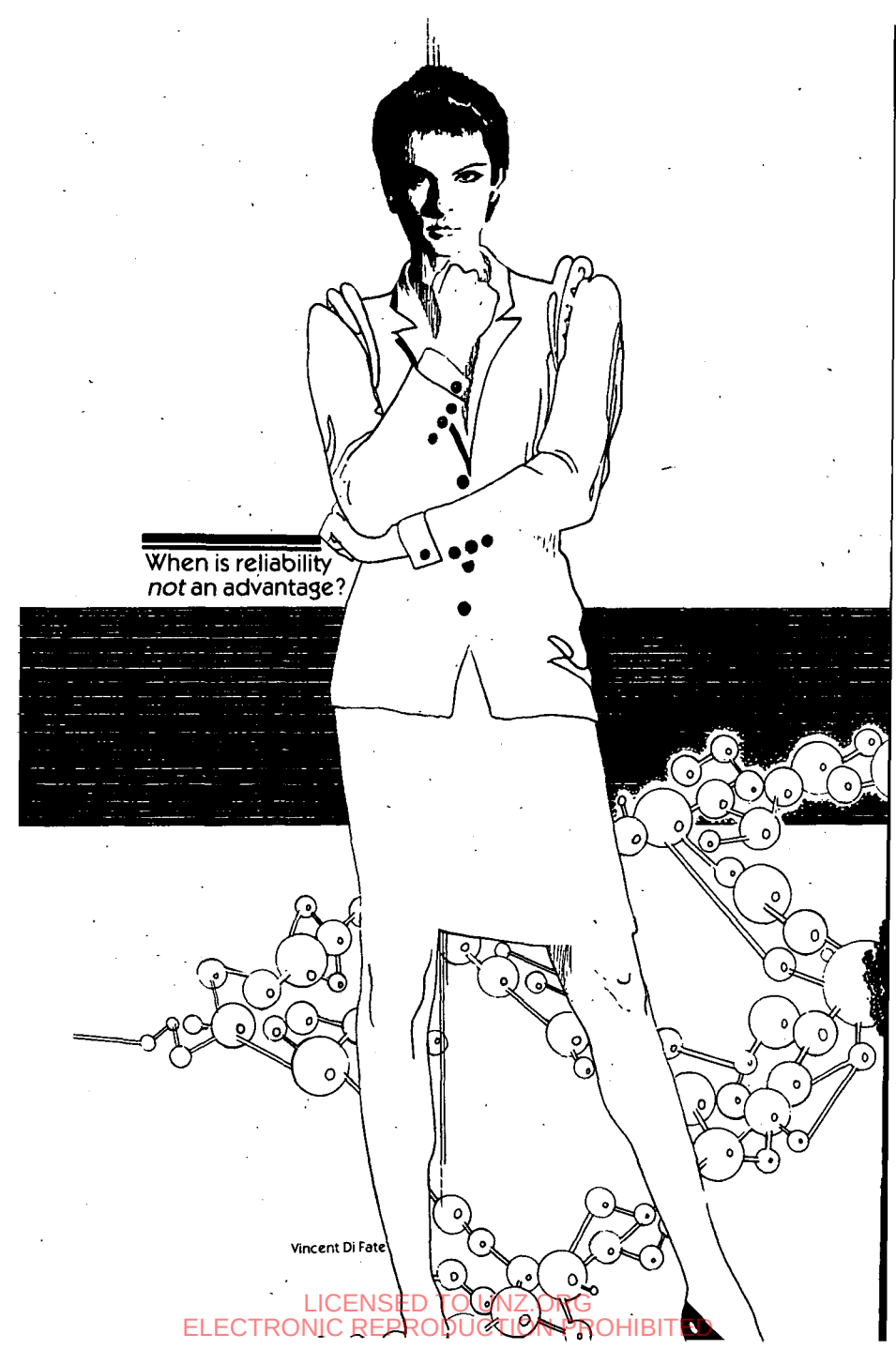

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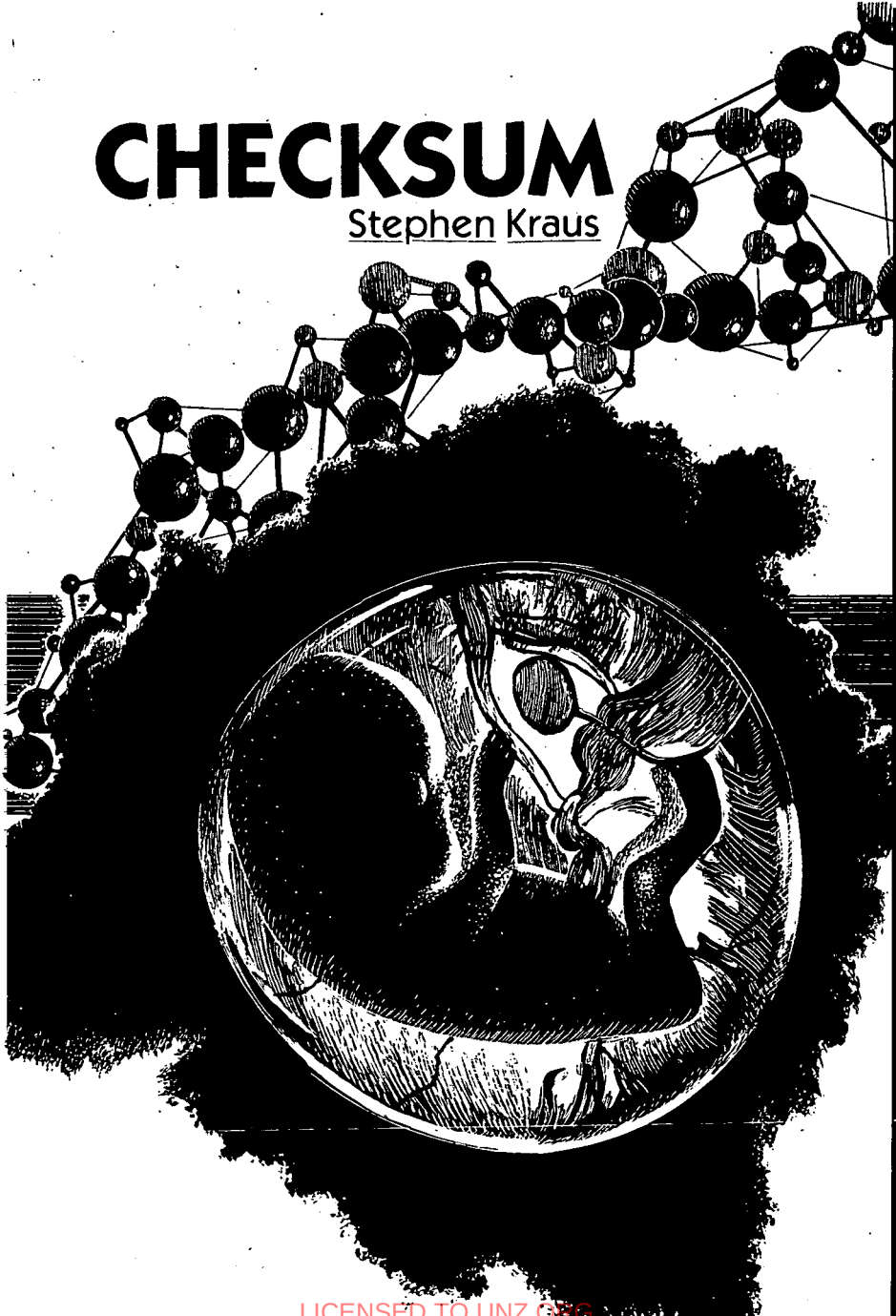
CHECKSUM

Stephen Kraus



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The lobbyist's genotype looked wrong.

I ran the pattern across the security monitor a second time. Base triplets scrolled by: GTG TCG GGA TGC . . . female, forty-six chromosomes, no visible damage . . . ATA AGG CGA . . .

I shrugged. Check it out later, maybe.

"Is there a problem?" the lobbyist asked.

I looked up. She was standing close enough to make me conscious of her skin chemistry, of how her limbs moved beneath her austere grey suit. Her face was striking: fresh, unblemished skin still slightly flushed from the humid summer day, bright grey eyes and dark hair cut fashionably short.

I'm afraid I stared for a moment.

"No," I said finally. "No problem. The chairman is expecting you . . ." I checked my corneal monitor ". . . Ms. Santorini. Follow me please."

I felt her watching me as we walked down the oiled corridor that led to the chairman's office. Her heels clicked out a precise rhythm on the parquet.

I opened the door at the far end. The chairman sat behind his semi-circular desk. He was a small, still man in his mid-sixties with a lined face and deep-set eyes. Everything about him was studied, deliberate.

"Miss Santorini?" he said in a penetrating voice. "Please come in."

I closed the door, then retraced my steps down the corridor. I turned the corner and slipped into the blue glare of my cube. No more than ten minutes later I heard the metronome click of the lobbyist's heels again. I saw her for a moment as she passed, and the scent of her skin came back to me suddenly, as if I had opened a perfumed letter. I was so distracted that I missed the chairman's first summons. Then the downlink chirped again, and I rushed down the corridor to his office.

He was standing in front of his desk. He kept pushing back a strand of grey hair that fell across his forehead. Perspiration oozed from the crevices in his face.

"Get me something on her," he said. His voice was toneless and abrupt.

"You mean Ms. Santorini?"

He nodded irritably. "Get me something dirty. I don't ever want to hear from her organization again."

I waited until the office was empty —until almost midnight—and the net was quiet and responsive. The net was where I lived, where I had power. My fingers stroked the keyball and my eyes focused inward on my corneal monitor. Most of the other users in the chairman's office had voice links—their idiosyncratic one-way conversations fractured my concentration during the day. But my relationship with the system was tactile, all feel and instinct. And that night my mind felt fine-honed, my hands sensitive and precise.

I began with the woman's credentials: Christa N. Santorini, age twenty-four, registered lobbyist with the Near Earth Development Coalition for the past three years. Private schools.

She came across very professionally, I thought, for someone with so little experience. I drummed my fingers on the desk. The information listed was far too superficial.

Her organization looked more promising. The NEDC advocated orbital

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power collection and subsidies for private space industries. Nonprofit. That meant lots of public records, lots of reporting requirements.

I initiated an IRS public records query first. Nonprofit organizations that solicited public funds had to file a form 990 every year—sources of income, expenses, salaries, everything. I ran a search on the federal contracts and grants register, cross-referencing space development. The search terminated in seconds. The NEDC had received a NASA grant to study the use of lunar materials as radiation shielding.

I routed a disclosure request with a priority authorization handle referencing the grant. Ten minutes later my downlink chirped and the form 990 landed in my queue.

The NEDC looked legitimate enough on paper: Founded in 2012 and in continuous operation since then. Located out on the old Beltway. Three full-time employees and a registered lobbyist—one C. N. Santorini. The file, for some reason, contained a greyscale image of her. I copied it out and tacked the sheet up above my desk.

The NEDC spent its money on educational programs and lobbying activities. Salaries and administrative expenses were modest. They believed; they didn't waste money. I paged down to revenues—private donations, all of them small, an occasional grant, and some income listed as unrelated to the principal business of the organization.

Actually, there was quite a bit of unrelated income. Its source showed up on an attachment: Convex Printing, Inc., a wholly owned subsidiary of the Near Earth Development Coalition. Convex Printing was a small local firm, quite profitable. . . . and all its profits funnelled directly into the NEDC.

I rubbed my nose (a nervous habit; I've suppressed others, this one persists). Why would space advocates run a printing firm? Nothing in the NEDC's records could tell me. And Convex Printing was a privately held corporation—it was under no obligation to disclose anything.

I tried a long shot. I pulled up the current list of vendors authorized to sell products and services to the government. The Printers and Typographic Arts heading listed 812 entries locally, including GS number 18742-4A: Convex Printing. A listing meant that they were courting government business—but it was no guarantee that any contracts were active.

I requested the Department of Agriculture purchase logs for the previous six months. I started a search and set it to roll over automatically to other departments.

I blinked my monitor off and found myself looking at Christa Santorini's picture. It wasn't an especially flattering likeness—she looked introspective, almost tragic. And beneath her flawless skin I thought I could see more: wistfulness, alienation, worldliness. I couldn't pin her down. Her face changed every time I looked at it.

My search terminated with a chirp. Two Department of Technology Development purchase orders referencing GS number 18742-A6 had turned up. I felt as if sparks were flying from my fingers. Convex Printing was doing business with the federal government—which meant that our office was authorized to

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investigate. I filed an audit request and routed it to the chairman for approval. Then I left the office.

At night my building led a sort of twilight life. Air sighed in the hallways, fluids surged overhead. Patterns emerged from the randomness as I walked: rhythms, syncopation, an organ-point drone from the electrical fixtures. I adjusted my pace to their cadence.

I waved at a sleepy guard and thumbed the checkout plate on my way out. The night was tropical—the ghost of a sweltering summer day. I picked up a runabout and drove around and around the old city, too wired to sleep.

The chairman called me into his office late the next morning. He sat on a corner of his desk with his shirt off. My eyes fastened on three long, parallel surgical scars that arced across his chest. Ng, our staff physician, listened to his heart.

"A slight arrhythmia," Ng said. "It is nothing to worry you."

The chairman's face darkened. "That's what my father's nurse said the night before he died." He spoke quietly, to himself rather than to Ng. There was a look of real horror in his face. "I'll never forget that nurse. She only looked at the instruments, never at him. She'd come into his room—my father was wasted to nothing by then from pancreatic cancer—she'd come in and look at the instruments. She'd say something reassuring. Then one evening she just pulled the sheet over his head."

"Very good, sir," Ng said, withdrawing silently.

The chairman's voice was just above a whisper: "I'd like to know that nurse's name. I'd like to know where she is now."

I waited at the door: "Would you like me to find out?"

The chairman resealed his shirt and waved me in. "Find out what?"

"Who the nurse was."

He compressed his thin lips. "No, let it go." He shook his head and walked around behind his desk. "What's this audit you want to do?"

"Convex Printing. Owned and operated by the Near Earth Development Coalition. They're supplying more than half of the NEDC's operating expenses."

The chairman settled into his customary posture—motionless, hands out of sight. "Laundering some cash?"

"Could be. They're hiding something. I'm sure of that much."

He nodded almost imperceptibly. "Keep me informed."

Convex Printing's general manager stood defensively in front of his ancient four-color press. The pungent smell of ink and lubricants saturated the air.

"What are you looking for?" he asked.

I spent a moment surveying the grimy metal rafters. The building was unconscionably hot.

"It's just a routine audit, Mr. Simon. Part of a much larger investigation that needn't concern you."

"I thought the GAO handled government audits," he said stubbornly.

"If they're important enough. Otherwise they authorize a staff member to do it. In this case, me. I trust that you'll cooperate." I was losing patience with him. He was in the way.

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Simon shifted from one foot to the other. "We've never been audited before."

"Somehow, Mr. Simon, that doesn't surprise me at all. Can we get started please? I'll need the invoices for the past twelve months. And a desk with an uplink. This one over here will do."

He looked me up and down for a long moment. Then, very slowly, he accessed the network and unlocked the invoice files.

I looked up half an hour later. Simon was still standing at the foot of the desk. I couldn't tell if the man was actually dishonest or if he was simply embarrassed at the state of his books.

"It looks as if I/Star and GenLab are your biggest customers," I said.

"I suppose so."

"What kind of printing do you do for them?"

"Packaging, mostly. They're pharmaceutical companies. We do their boxes and labels."

I nodded. "I notice that I/Star gets volume discounts for most of their orders but GenLab doesn't. Why is that?"

He shrugged. "GenLab never asks for discounts."

Just then the big press behind him started up with a roar. I had to shout: "How much is that thing worth?" I pointed at the press. "It doesn't show up on your fixed assets ledger."

"Oh, we depreciated it years ago. We got it from GenLab—we were their internal printing division before we spun out in '012."

The machine began swallowing paper with a machine gun rattle. I leaned towards him and yelled: "I'd like to see the records of the founding of the company."

"We'll have to go upstairs."

"Upstairs?"

Simon looked uncomfortable. "They're in a filing cabinet. You know, on paper."

I pushed through a lunch-hour crowd of aides and contractors and disaffected civil servants, all perspiring heavily in the noon Sun. I climbed dished steps and pushed into a side lobby of my building. In the cool darkness I nearly collided with Christa Santorini.

She apologized automatically before she recognized me. "You're Everett's aide, aren't you?"

I nodded.

"I was in your office yesterday."

I nodded again and smiled. "I remember." Civil servants jostled and pushed by us. We stood very close together, obstructions in the tide of government. "I'm Glen Faux."

She offered her hand. It felt unnaturally cool. "Chris Santorini."

She seemed to be studying me. "Actually, I'm glad I ran into you. I don't think I took the right approach with Everett yesterday."

I couldn't help laughing. "You could say that."

"He's very important to us. He's blocking three different near-earth bills. . . ."

We looked at each other awkwardly for a moment.

"I wonder if you could help me understand him a little better," she said.

"I'd like to understand him myself."

"No, really. Could I take you out to lunch tomorrow?"

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I should have declined—I was investigating her, after all. I was supposed to avoid conflicts of interest.

"All right," I said.

"Meet me at the Olmec Cafe at noon. OK?"

"OK."

She smiled radiantly, then walked through the door into an explosion of sunlight.

I spent a tedious afternoon reviewing financial statements and cross-checking purchase logs. The only peculiarity I could turn up in Convex Printing's accounts was its cozy relationship with GenLab. The closer I looked, the more convinced I became that GenLab was intentionally channeling funds to the Near Earth Development Coalition via Convex. I routed a request to the Department of Commerce for GenLab's public records. The system advised me that it couldn't respond for several hours. The company had been founded in 1996, and some of its files were stored off-line on optical disk. Someone would have to load the things by hand.

The chairman's summons chirped. I combed my hair and headed down the corridor. The chairman looked magisterial, arms folded, face deep in shadow. One of our secretaries stood across from him. She was new—I couldn't remember her name—and obviously terrified. The chairman nodded at me when I entered, but said nothing.

He produced a cup of miso from a corner of his desk and placed it in front of her.

"Miss Levin, would you taste this please?"

She picked up the mug. Her hands trembled, and some liquid sloshed over the top.

"Do you notice anything out of the ordinary?" the chairman asked.

She shook her head numbly.

"*Finish it.*"

She did so, gulping the soup down so quickly that she started to choke.

"Miss Levin, you made that miso with tap water. Washington tap water contains dioxane in quantities exceeding three parts per million. It contains eighty-two other known carcinogens, including dangerous amounts of trichloroethylene and cesium-137." He leaned forwards and put his hands on the desk. "Now," he said, "would you fetch me another cup?"

She stammered something and fled, giving me a brief, horrified look as she passed. I couldn't meet her eyes.

The chairman dismissed me with a curt nod. He hadn't wanted to see me at all. He'd wanted an audience for a public humiliation.

The next morning I found a sheaf of GenLab files waiting in my queue. I looked at the stockholder data first. David Sandoval was GenLab's founder and served as its president and CEO until his death in 2022 at the age of seventy-one. Carla and Richard Sandoval took over as co-chairpersons of the company that year. No changes since then. A family business, in short—and past time, it seemed to me, for the third generation of Sandovals to step in.

IRS, SEC, and Justice Department records showed no investigations pending. Nor did GenLab have any active government contracts. There was noth-

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ing at all to indicate why a genetic engineering firm would be secretly funding space development. The NEDC was a lean and heartfelt organization. Why obscure its support so carefully?

I paged down to the Department of Commerce files. GenLab's product list showed four drugs for arthritis and related pathology. The company held fourteen active patents, all for specific pharmaceuticals.

None of that helped. After some hesitation I routed a request for the personal records of the company officers. That required the approval of a federal judge. The chairman kept a tame one, but I couldn't expect results for a while.

I flexed my fingers, wondering what to do next. Perhaps there were some other footprints in the data bases? I ran a search for non-profit organizations with federal lobbyists and significant unrelated income from private corporations. The system was clogged; nothing happened for minutes. I stood up and paced in my cube. One of my neighbors pounded on our shared wall, telling me to quiet down. I ignored her.

The system finally responded with four organizations: Overpopulation Alert, Friends of the Forest, Disarmament Now, and Citizens for a Cleaner Earth. Eclectic liberal causes all, technology oriented, more or less: a pattern.

I knew the questions to ask now. I began with Overpopulation Alert. That organization owned 51 percent of Baywood Container, a small firm that manufactured vials and other sterile packaging for pharmaceuticals.

I tapped my uplink. A computer voice answered.

"Baywood Container. How may I help you?"

"Accounts receivable."

"Baywood Container. How may I help you?"

"Accounts receivable," I growled again. I hated computer answering machines.

"Baywood Container. How may I help you?"

"Accounts receivable, *please*."

That seemed to work. A human voice came on the line after a while.

"This is Glen Faux at GenLab receiving," I said. "I've got a shipment that came in without a packing slip. Can you help me track it down?"

"Sure thing, Glen. Let me pull up your account. OK, I've got it. I only show one shipment in the last week."

"What was in it?"

"4,000 units, A-609 poly vials. Your P.O. number R607-9882."

"Full price?"

He sounded perplexed. "No discount code shown, yes."

"That sounds like it, all right. Thanks very much."

I disconnected. That had been simple enough. I'd established a link between GenLab and Overpopulation Alert via Baywood Container. Doubtless Friends of the Forest and the others would connect up as well.

I rubbed my nose. What was GenLab up to? This was no simple money laundering scheme. The arrangements were secretive and devious—but they didn't seem at all improper.

I left the office and stepped outside into a lacerating summer morning. I checked out a runabout and drove out to the old Beltway. The GenLab build-

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ing was tucked behind a grove of untended trees: tilt-up concrete, one story, and thoroughly anonymous. A small company, maybe two hundred employees.

A facade. It told me nothing. I turned around and drove back to the city before the lunch hour traffic started.

The Olmec Cafe was quiet and leafy, decorated with petroglyphs. Chris was waiting for me. She looked slim and elegant in a clinging spray-sweater and a mirror necklace that set off the astonishsing clarity of her skin. She smiled and waved when she saw me.

I complimented her on her choice of restaurants.

"Actually, I haven't been here before," she said. "But I liked this trend the last time around."

"Southwestern isn't new? When was it popular before?"

She looked uncomfortable. "Oh, a few years ago." She quickly said something uncomplimentary about the weather, and we complained about the heat and the traffic, which really had gotten worse in the last year or two.

"Even though the runabouts have gotten smaller," I pointed out.

"The new ones make me think of cocoons," she said.

"Each with a civil servant inside, encased like some gigantic caterpillar."

"That's not what I meant."

"It's all right. We are a sort of caterpillar-like crowd—you know, blind and boneless, earth-bound."

"I think caterpillars are cute."

She looked directly into my eyes.

Then she asked, out of nowhere: "Have you seen the new exhibit of Japanese wood-block prints at the National Gallery?"

"Yes," I said, a little embarrassed at my eagerness. "Twice, actually."

She smiled. "I thought you might have."

"The Kabuki actors are my favorites. I've gotten so I can recognize a few of the traditional roles—Benten Kozo from *Benten The Thief* and Benkei in *The Subscription List*."

"Have you ever seen them played?"

"Many times. They're wonderful, so much larger than life. So identifiably good or evil."

She looked thoughtful. "It's hard to work in a moral vacuum, isn't it?"

I'd missed something. "Pardon?"

"That's how I've always seen Washington. No rules. No structure. Just maneuvering and damage control. Kabuki is so much the opposite—you can always measure yourself against a narrowly defined code."

"There's a way to be a hero."

"Exactly." She shook her head. The entire subject seemed distasteful to her. "I wouldn't have your job for anything, Glen. I can't imagine what working with Everett must be like."

I hesitated. I always avoided discussing the chairman. "He appreciates me," I said cautiously. "He's almost my patron."

She leaned closer. She refused to release my eyes. "I don't understand, Glen. Why do you want to be a part of that world?"

Her look was compelling—she expected an answer. And I didn't know how to lie to her.

"I can't really explain it," I said. "Except that I've always felt like an

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outsider everywhere else. I'm a player here. I'm useful."

She reached across the table and touched my hand. Her look softened. From a distance we must have seemed to be an intimate couple. "I don't think you know what it means to be an outsider, Glen."

Our blue corn fritters and black bean purée arrived just then—before I could ask her what she meant. Chris concentrated on lunch. She ate intently and rapidly.

"Where did I go wrong with Everett?" she asked after a few minutes.

"I don't know. What did you say to him?"

"I reminded him that he had a responsibility to his children, that the Earth is finite—the usual things. To someone his age it might not seem important. . . . That's where he interrupted. He said that his age didn't have anything to do with his opinions."

"That's all?"

"No. He said some stupid things. He talked about short-term priorities. He said there'd be a time for space development, that it was on his agenda. I reminded him that he wasn't going to live forever. That's when he threw me out."

I nodded. "Mortality is a sensitive issue with him."

"Is that it? Unfortunate. I'll have to try again anyway. This is too important. We have to start weaning ourselves from Earth. We have to start moving outwards. If we don't do it this generation, I'm afraid we never will."

Her sincerity was a tangible thing. It made me feel protective.

"Chris," I said. "I don't know what your organization is proposing, but be careful. If you get the chairman interested in your technology, he'll end up owning it. I've seen it happen. He was a venture capitalist before he went into politics, and he's kept all those connections intact."

I was being indiscreet—and I realized that I didn't particularly care. "Do you know about the superconducting light rail system in Orlando? It was built on his appropriations. S/Rail doesn't make a move without consulting him. I see their executives in here every week. The optical telecom switching system—it's the same thing. He's on the board of all the member companies. He runs the whole net as far as I can figure out."

She nodded. "I know. We need his cooperation. We're willing to listen to whatever he proposes."

I sighed. Really, it wasn't any of my business. I tried a different subject: "I'm afraid I don't know much about near-earth development. Tell me a little?"

Tea appeared. She sipped at it, looking at me steadily through the rising steam.

"Of course," she said.

I listened to her for the next two hours.

Back in my cube, I found the judicial authorization codes I needed to unlock Richard and Carla Sandoval's files. The chairman's pet judge had come through in record time. I paged through them: vital statistics, social security, FBI, credit histories—everything that mattered. Minutiae poured in: school transcripts, police records, bank balances,

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address changes, foreign travel, retina prints, genotypes.

Both Richard and Carla were *in vitro* fertilization/implant births (Carla in 1998 and Richard in 1999). Their father was David Sandoval, the founder of GenLab. Richard and Carla graduated from the University of California at Berkeley with degrees in cell biology. Neither were married (so there wouldn't be a third generation of Sandovals after all!). They were modest spenders.

I traced the mazelike net of Richard's retina capillaries and the endless codon streams of Carla's genotype. My attention wandered . . . GTG TCG GGA TGC . . .

Then it snapped back into focus.

That pattern looked familiar. I ran it back, widening the window until the display filled my entire field of vision . . . ATA AGG CGA . . . I sensed the same indefinable wrongness I had noticed in Chris's genotype.

I ran Carla Sandoval's sequence through a standard statistics program. The chromosome count was right enough, but the molecular weight fell just beyond the high end of the normal range. Base triplets rolled across my monitor: CTA AAG CGC . . . No landmarks. Everything looked slightly skewed, unfamiliar.

I got up, made myself a cup of miso and drank it in a single scalding gulp. I called up the current version of the FBI genotype identification program and set it to compare Carla Sandoval's sequence with Christa Santorini's. The program ran for a very long time. It terminated with a chirp and a message: MATCH, PROBABILITY FIVE NINES.

I ran the program again, then a third time. I stood up and kicked the rice-paper walls of my cube. None of it made sense. Ordinarily, a genotype match was considered the most conclusive form of identification. But Carla Sandoval was over sixty years old. . . .

The chairman's summons line buzzed. I slicked back my hair and hustled down the corridor. He sat behind his desk, and a woman I didn't recognize sat across from him. She was in her fifties and very well dressed. I pegged her as one of the chairman's creatures from the sullen way she looked around the room, at the rug, at me—at everything except the chairman.

"This is Alis Samna," he said. "She's the CEO of I/Star."

"Pleased to meet you," I said.

She nodded slightly.

The chairman invited me to review what I knew about GenLab. Neither of them asked me to sit down.

"Well, they're funding several future-oriented programs—population control, reforestation, that sort of thing—but they're hiding their investments carefully."

"Does that make any sense to you?" the chairman asked his visitor.

"More or less. They keep a low profile. We see their people at conferences sometimes, preaching social responsibility. What have they got?"

I felt my way to a chair and sat down. "I don't have much to go on yet, but I think they're doing some unauthorized gene tampering. I've been looking at the genotype of one of their corporate officers. The molecular weight is too high."

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"Do they have any FDA clearances for human genetic work?"

"No."

"That doesn't exactly square with social responsibility, now does it?" the chairman asked.

She shrugged. She didn't seem much interested. "All right. Route me a copy of the genotype. I'll pass it along to R & D." She turned to the chairman without quite looking at him. "Is that all right with you?"

He nodded. "Keep this quiet."

"Of course."

"Was there anything else?" I asked.

The chairman waved me away. I evaporated from the room in the manner of junior aides. If I'd stayed any longer, I would have had to tell them about Chris.

I huddled in my cube again and watched Chris's genotype scroll across my monitor, waiting for the patterns to become meaningful. I queried the net for a DNA analysis program and found an old, idiosyncratic one that took me several minutes to figure out. I branched to a biochemical data base and asked it for the name of some common proteins. The net informed me, rather pedantically, that glutathione is found in everything from *E. coli* to *Homo sapiens*. I told the program to search Chris's genome for the corresponding gene.

Office sounds welled up around me: humming lights, footfalls of scurrying aides, the crinkle of a candy wrapper —sounds that hadn't changed in a hundred years.

The search terminated with a flashing message: SEQUENCE NOT FOUND. I ran searches for the chymotrypsin gene, for actin, for three subunits of cytochrome *c* oxidase. Chris didn't have any of them.

I felt chilled. I'd had lunch a few hours earlier with a fascinating woman who shared my appreciation for New Mexican cooking and Japanese theater. But she lacked genetic sequences that I had in common with a flatworm.

Who *was* she?

Perhaps her genetic code was different in some way. Her father was a cell biologist—he might have tampered with it. The system informed me (condescendingly, I thought) that there were ten to the seventy-fifth power possible genetic codes. Testing for each would take millennia.

I rubbed my nose.

It had to be something simple. A different initiator codon, perhaps? I tried to remember. All genes began with the same base triplet—ATG, the system informed me. I rigged the program to ignore initiator codons and started up the search for glutathione again. Almost immediately the seventh chromosome lit up near the center.

I took a deep breath and zoomed in on the illuminated region. The display left me more confused than ever. The ATG codon was there, all right—it was simply in the wrong place. An extraneous codon separated it from the legitimate beginning of the gene. I rechecked the chymotrypsin and actin genes. Each had an extra codon at their front ends—all different.

I stood up and left the office. Long, rapid strides took me down to the river. I studied the old buildings that fronted the esplanade, picked out patterns in their multicolored brickwork. I stood at

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the metal railing, green with age, until the Sun set behind the cherry trees and the shanties across the river.

All of her genes began with an extra codon. Why? If I were looking at computer data, I'd have guessed it was a checksum. . . .

I came to a dead stop. Crickets chirped maddeningly. I hesitated for a split second, then I reached for my uplink.

"Let's hear it," the chairman said.

He was in evening dress. It seemed that I had dragged him away from a dinner party. I paced in front of his desk.

"I think GenLab has developed a method for extending human lifespans indefinitely."

The chairman's expression turned blank, unreadable.

"Go on," he said.

"As I suspected, GenLab has been modifying human genetic material." I held up my hand. "No, I don't think they're doing anything technically illegal. They aren't repairing defects —they're *adding* information. They've actually inserted a checksum into each active gene—"

"Slow down," he said sharply. "Tell me what that means."

I took a deep breath. "Sorry. Take a set of numbers, add them up, store the sum—or only its last digit if you prefer. Later, if you want to check the integrity of your data, add the numbers up again and compare the result with the stored checksum. If the two sums are the same, your data hasn't changed. Do you follow?"

"Yes." He sounded impatient. "What is the good of all that?"

"Don't you see? They can live forever—or as good as. They'll never get cancer, they won't age. . . ."

The chairman walked around his desk and stood directly in my path.

"*Slow down.* Explain that."

I came to a halt a few feet from him. My hands and arms continued to move. "I haven't really absorbed this myself—I just had time to check out my analysis before you got here. I'm not an expert, you know. I had a few courses in college—I was interested—and I need to understand genotyping, of course. . . ."

The chairman was staring fiercely at me.

"All right." I took another deep breath. "Sorry. We—humans—we weren't designed to live more that twenty-five or thirty years. We've raised our children by then. We're a drain on the ecosystem. It's only recently that we've been able to circumvent nature. We can replace the critical components of our cardiovascular system, we can handle infections. But cancer always gets us sooner or later—and this century it's generally been sooner.

"It starts with DNA damage—usually due to chemical mutagens. The DNA strand is incredibly fragile; it's only a few atoms thick. The repair mechanisms are astonishingly clever. But they don't always work. One time in, I don't know, ten thousand they fail. Most often the cell simply dies. But sometimes a critical component is hit—the cell's reproduction mechanism, or the receptors that make it stick to its neighbors. It starts to grow out of control, it spreads through the body. Even then the immune system can usually deal with it,

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or treatments exist. But eventually, way out on the asymptote, you run out of defenses."

The chairman nodded tensely. His eyes were locked onto mine.

"What the GenLab people did was to improve the DNA error checking process. They compute a checksum for each gene and encode it as a triplet of bases—a codon. I'd guess they have a virus that infects the cell, reads the DNA, then alters it by inserting the checksum codon at the beginning of every gene. Actually, it's not really the sum—there are only sixty-four possible codons, so it's the remainder of the sum modulo sixty-four . . ."

The chairman took a step towards me, glowering.

I retreated. "Right. That part isn't important. There's some other cellular mechanism that operates during protein synthesis—that one *is* important. It must read the messenger RNA that's been transcribed from the modified DNA and verify the checksum. If it's wrong, it shuts everything down. I imagine the cell dies. But it can't ever become cancerous! *It can't make mistakes.* And it isn't just cancer. Aging is largely an accumulation of errors."

The chairman stood as still as if he were made of wax. "Have they patented any of this?" he asked.

"No. They've gone to a lot of trouble to keep it secret."

"And they've been able to apply the method . . . successfully?"

I nodded. "The lobbyist who was here last week from the Near Earth Development Coalition—Christa Santorini—"

"The irritating young woman."

"Yes. Her name is really Carla Sandoval. She's a director of GenLab. She's sixty-two years old."

He pushed his hair back jerkily. I noticed for the first time how heavily he was perspiring.

"You're quite sure of all this?"

"Absolutely. It's the only explanation that makes sense."

He dug his fingers into my arm. "How long?" he asked. "How long can she live?"

"I don't know. If she avoids accidents, maybe three hundred years, four hundred. Until she wears out, I guess."

The chairman released me and walked behind his desk. He seemed dazed, unsteady. "Stay where I can find you."

I nodded and left his office. Halfway down the corridor I realized that he'd left the most critical question of all unasked.

I wandered back to my cube—I didn't know what else to do. I forced myself to breathe slowly, to think.

A cycle—it began with Christa Santorini and the NEDC. That led to Simon at Convex Printing. Then came GenLab and Carla Sandoval, and finally Christa Santorini again.

How many more were there? Thousands perhaps, each absolutely loyal—a paranoid nightmare turned real. I imagined them slowly infiltrating our society, moving into sensitive positions, waiting for the right moment. Really, it was remarkable that they hadn't been flushed out sooner.

They'd have to protect themselves now, isolate themselves. The prospect was appalling. Society would stratify more absolutely than at any time since

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the middle ages. But people weren't as docile about such things as they used to be. The Sandovals—I didn't know what else to call them (GenLab Man?)—would have to be very careful. They'd hire security forces and promise them a dose of immortality after ten or twenty years of faithful service perhaps. . . .

Eternal youth. It made me think of Greek heros abreast tranquil azure seas or gathered at a glittering court. But reality was far more treacherous. Reality was smoke-filled rooms and barbed wire.

Heel-clicks sounded in the corridor. I looked up and saw Alis Samna walking briskly towards the chairman's office.

I felt the walls tighten around me until I couldn't breathe. I thought about my career—six years as the chairman's systems manager, the only job I'd ever had. I thought about Chris, and what I'd just done to her.

I stood up uncertainly and left as quietly as I could. I waited until I was outside the building before reaching for my uplink. I was about to commit an act of disloyalty—arguably one of treason. I couldn't bring myself to do it from my office.

"Hello?" said a tired voice.

"Chris? It's Glen Faux."

Silence. "It's late, Glen."

"I know. I'm sorry. I have to speak to you."

"Now?"

"I'm afraid so."

"I have an early appointment "

"*Chris*. I know who you are. I know about your genotype."

Silence again. I could hear my heartbeat. I could hear her breathing.

"Can you come to my place?" she asked.

Her apartment was modern and impersonal: plastic, ceramic and paper in cool greys—all of it as transient as her identity. Chris was alone. She wore a yakata, and she looked wary and vulnerable and painfully beautiful.

"Would you like some miso?" she asked. "I'll start the water."

I sat on her nondescript couch. I felt exhausted. Our lunch together had only been a few hours earlier; it felt like weeks.

"How much do you know about us?" she asked.

"I know about your association with GenLab and about the checksum mechanism in your DNA. I know that your name is Carla Sandoval."

She nodded. "Please call me Chris." Her voice lacked any anger or calculation. She sounded tired. "What gave us away?"

"Nothing specific. I followed your trail back to GenLab. That was easy enough. I identified you from your genotype. Something about the way it looked bothered me. So I dug around until I sorted the mechanism out."

"You noticed something different just by *looking* at my genotype?"

I shrugged.

She shook her head and walked into the kitchen. I heard her filling a pot with boiling water.

"I'm sorry," I said. "It's what I do. It's what I'm good at."

She blended in the miso paste and the wakame leaves. "Roger Simon at Convex Printing told me that you were auditing him. We probably should have

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done something then. We talked about it. That's about all we ever do."

She emerged from the kitchen with two steaming cups. She sat on the couch very close to me. The cup scorched my hands.

I blew on the liquid's shining surface. "The modification to your genome is very clever. My congratulations to whoever thought of it."

"My father, David Sandoval. He was a very unusual man. He spent years designing his method before there was any way of applying it. Even later, it was just an academic exercise to him —something abstract, something that involved molecules and machines, not people. He was obsessive. He couldn't think about anything else." She looked at me sadly. "You remind me of him a little."

The windows were open, and the night's moist warmth filled her apartment. But I still felt chilled. I took a burning sip of the miso.

"What became of your father?"

"He died in an automobile accident—ran his car off an embankment. He killed himself, I think."

"Killed himself? Why?"

"He realized what he had done to us."

Her face was only a meter from mine. I was struck again by the perfection of her skin. And now I understood why it was so. Moles and blemishes were mistakes—harmless errors made by cells that were constantly renewing themselves.

But her cells never made mistakes.

In that moment I understood her father's obsession perfectly. I felt it myself. "I was only able to figure out a part of the process," I said. "How does the cell verify the contents of a gene?"

"There's an organelle my father developed—he called it a compusome. It's a modified ribosome, a sort of molecular abacus." She spoke rapidly, as if the words had been waiting for years to come out.

"The compusome intercepts the messenger RNA transcribed from the gene and adds up the codon values. If the result matches the validation code—the checksum, you called it—an enzyme is activated that snips off the extra codon. If the sum is wrong, a different enzyme disables the messenger RNA. It's clever, as you said."

More than clever, I thought. It was evolution short-circuiting itself. Four billion years of trial and error, and the best nature could come up with was *man*. How much longer would evolution have taken to manage David Sandoval's trick? And it was a trick that only GenLab had. I couldn't begin to imagine the power they would wield. The government, the computer industry, the military—they'd all be the humblest of supplicants.

But none of that squared with the picture of Chris sitting miserably at the edge of her couch. I was missing something.

She reached out and touched my hand. The top of her robe had come loose. She made no effort to secure it. "When you called, you said that you needed to talk to me."

I'd forgotten. She'd distracted me; she always did. "I wanted to warn you," I said. "The chairman knows

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about GenLab. You'll have to protect yourselves."

"Protect ourselves how?" A gallows smile: "Our resources are limited. There are only fourteen of us."

"*Fourteen?*"

"We shut down my father's equipment after he died." Her face was drawn. For the first time she truly looked her age. "I don't think you appreciate the position we're in. We've kept this hidden for sixty years. I don't think anyone will forgive us for that. I don't think anyone will forgive us for being who we are."

"That's a little melodramatic—"

"Is it? Strictly speaking, you and I don't belong to the same *species*, Glen. I'm only fertile with my brothers and sisters. Think about it. Any child whose parents have the validation codon in their genome will inherit it. Our line will always be separate from yours. And we can't ever mutate. We can't change. We're the end of evolution."

For the first time I heard a hint of reckless pride in her voice. She looked straight into my eyes. "Now tell me that I'm being overly dramatic."

I couldn't answer her.

"What are you going to do?" I asked.

"I'm not sure. I'll have to talk to my brother."

"You must have planned for this."

"Yes, of course. We knew it was just a matter of time. We'd planned to destroy our technology—every vial, every sequencer, everything we know. But that won't work now. You have our genotype. The code for the compusome is in there, all our secrets. It won't take long to reproduce our method."

The hopelessness in her voice infuriated me. Somehow, I realized, I'd become an apologist for her father, for all her people. "Maybe not," I said. "But you have the advantage now. *Use it*. The chairman won't give you much time."

She shook her head. "We're not much for acting quickly. We're not much for doing anything, really."

She looked past me to the window and the luminous summer night beyond it. "I dream about being normal sometimes," she said, "about taking chances. Have you thought about what it's like being one of us? We've got so much to lose. We get in the habit of avoiding trouble, postponing decisions. We talk. We're so passive—sometimes I feel like I'm living my life at five miles per hour."

I stood up and moved away from the couch. I couldn't think clearly with her so close. Why was she wearing a robe anyway? She'd had time to change before I arrived.

"You seem to work hard enough to promote near-earth development and rain forests and all the rest."

"That isn't work, Glen. It's survival. Believe me, issues like population control and air quality stop being abstractions when you can reasonably expect to live for three hundred years."

"*It's survival now too.*" I took a deep breath. "Chris, listen. My career ended an hour ago when I called you. That job was the only thing in my life that mattered to me, and it *ended*. I did it for a reason. I couldn't let the chairman get control of your company. Can you understand that? He won't ever have your vision of the future. You've dealt with him. Do you think he'll support your

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programs? Do you think he cares about *rain forests?* You were afraid of creating an insular, privileged elite. Imagine what *he* would do with your technology!''

She looked back at me with enormous eyes.

''I know how power works,'' I said. ''I've learned that much these last six years. People will want what you have. They'll do what you say. They'll protect you. The chairman is in a weak position—he isn't rational on this subject. And I don't think he has all the facts.''

She stood up and took both my hands. ''All right, Glen, stop. It's late. Tell me in the morning.''

I started to say something and stopped. I looked at her quizzically.

''In the morning,'' she repeated. ''Don't you want to stay?''

The room was cavernous and ill-lit, a warehouse, really. Shafts of dusty sunlight slanted down from skylights high overhead, conspicuously avoiding the knot of people at the far end. The air was motionless and stifling. I perspired simply from standing still.

Most of the warehouse contained odd-shaped machines covered with tarps, and the walls were lined with stacks of pamphlets. I was close enough to read a few of the titles: ''Rain Forest Reclamation, An Ecological Imperative,'' ''Baywood Container, Annual Report 2041,'' ''Population Alert Bulletin.''

My eyes adjusted to the darkness. I was most curious about the people at the far end. They resembled each other in posture and economy of motion, but several had Asian features, one was Indian, another East African. Evidently Chris's reference to her brothers and sisters was largely metaphorical. They stood very close together—touching each other, in fact, supporting each other. I counted fourteen. Their faces all looked like Chris's: smooth, unblemished, perfect.

The receptionist, with frightened eyes, scuttled away and left me standing by myself near a wall. I was uncertain of my status or my function. Chris had woken me with the news that the chairman was on his way over to see her. That was all I knew.

After a few minutes the door connecting the warehouse to the main GenLab building opened and white laboratory light streamed around two figures silhouetted at the entrance. One was short and squat, the other taller and more graceful. They moved forward into the dust and disorder until both stood only a few feet from me. Neither acknowledged my presence.

I sensed some agitation in the group at the far end. At length they spread out into an approximate semicircle. Another minute passed, and a single figure emerged unconfidently from the center of the arc. I wasn't sure it was Chris until she was standing practically beside me. Silence closed round us again. I felt like a second at an ancient duel—taut and helpless and certain of disaster, unsure only of what form it would take.

''Good morning, Miss Sandoval,'' the chairman said. ''It's a pleasure to see you again.''

The enormity of the space we stood in made him seem almost dwarfish, but his penetrating voice reached around every box and pillar and dust-enshrouded machine. I recognized his

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companion as Alis Samna. She wore the same sullen expression I'd seen at our meeting the previous afternoon.

"Good morning, Mr. Everett," Chris said. "Why are you here?"

The chairman pushed his hair back. "I have a proposal for you. First, though, you should be aware that I/Star filed a patent application a few hours ago for error-correcting genetic modifications. The filing is sufficiently complete to exclude GenLab from engaging in any similar business."

"*You have no right*—"

The chairman cut in smoothly. "Mrs. Samna assures me that I/Star has no idea how to apply the method at present. They may be years away from repeating your work. That being the case, we propose to grant exclusive manufacturing rights to GenLab on very generous terms."

"What rights would I/Star retain?" Chris asked.

"Marketing and distribution. I'm sure you'll agree that I/Star's distribution network is far better suited than yours to a product of this importance."

"Meaning that you control who receives treatment?"

"Believe me, Miss Sandoval, you don't want that responsibility."

Chris glared. "Don't tell me what to believe, Mr. Everett."

The chairman moved closer to her. "As you wish. Just remember—*we* own that technology now. We'll be able to recreate it eventually. But I lack your patience. You've waited for most of a century now, doing nothing, quietly promoting your little causes. What did you think you were doing, preparing the world for your discoveries?"

She stiffened. "Something like that."

"Don't delude yourself, Miss Sandoval. Better advocates than you have been riding those hobby horses for a hundred years. I've seen a dozen proposals for commercial space projects come across my desk—none of which explained how they were going to be profitable."

He stepped forward again. Now his face was only a few inches from Chris's.

"No, I don't think that's the reason at all. You never expected the world to be ready. The truth is that you just couldn't pull the trigger." He pointed to the entrance. "You couldn't open that door and look into the sunlight. No more quiet little company then. No more simple decisions. Security, regulation, injunctions, fighting the fringe groups, constant government scrutiny."

His voice had a bite to it, an intensity that couldn't be ignored. It stretched my nerves like piano wire.

"Who dies? Who lives? You'd have to decide that every day. It's brutalizing; it changes you. I know. And I don't think you want that, Miss Sandoval. I don't think you want that at all."

Chris shuddered and shrank back from him. Dust swam in the light that arced down from the ceiling. Nothing else moved.

The chairman took a long, weary breath.

"Whatever you may think, I'm not an unreasonable man. I want to work with you. You've done something remarkable here."

I read his signature in that last exchange. Intimidation, followed by reconciliation—on his own terms. I'd heard it a thousand times.

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"Don't listen to him," I said. I was startled by how small my voice sounded. "He's good at this. Don't let him get started."

Alis Samna looked at me curiously. The chairman's eyes remained fixed on Chris.

"You can contest their patent," I went on. "You had the technology first. You're protected."

"Stay out of this, Faux," the chairman said quietly.

Chris's eyes met mine for a moment. She seemed to draw herself together. "Thank you for your proposal, Mr. Everett," she said, "but I have to believe that my father wanted us to be the custodians of his technology, not you."

The chairman took a handkerchief out of his pocket and crushed it in one hand.

"*Perhaps you didn't hear me.* You don't have the option of refusing our offer. We filed first. One patent in ten thousand is granted to a later filing." He very nearly smiled. "And I assure you, I have considerable influence with the commissioner."

"This case would never make it before the commissioner," Chris said. "We can clearly demonstrate prior art."

His smile broadened. "I doubt you could." He pointed at the machines. "Your electronic records are inadmissible, as you must know."

"My genotype is very compelling evidence, Mr. Everett."

"Perhaps. But I doubt you can prove when your treatment occurred. I have the unworthy suspicion that your operation was an undocumented one."

Chris was silent for a moment. She looked at me wonderingly. "He really doesn't know, does he?"

"*Know what?*" the chairman demanded.

A spectrum of emotions flashed across her face: astonishment, relief, pity.

The chairman pushed back his hair.

"Our method can only be applied at conception," Chris said, "to a single fertilized ovum. I was sure you knew. The cell has to be held in stasis for days while the genome is modified. The process could never be applied to a mature organism."

I watched the chairman's face as she spoke. It turned pale, then ashen, then mottled and corpse-like.

"So clearly our method is as old as I am," she added. "I'm sure you won't have any trouble verifying that."

He took a step backwards, as if he had been struck. He wiped his forehead. Alis Samna was nodding slowly.

"Can it be true?" the chairman asked her.

Her look was purely contemptuous. "I don't doubt it. I told you we should have brought my R & D people in on this. It definitely limits our interest." She looked at him curiously for a moment, as if he were a sort of specimen. "You were afraid to ask," she said. "That's it, isn't it? You were so desperate to get that treatment for yourself you didn't want to know the truth."

She turned to go. "I'll withdraw our patent filing, Ms. Sandoval. If you're interested, I think we can help each other. Call me." She glanced again at the chairman. "Pathetic," she said, only half to herself.

The chairman's face held the same look of horror I recalled from the day he told me about his father's nurse. He turned towards me very slowly.

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"You're finished, Faux," he said. "You never existed."

I flinched and squeezed my eyes shut. After a minute I heard his receding footsteps. When I opened my eyes again, Chris was talking to one of her people—a tall man who resembled her considerably (her brother Richard, I decided). He left, and the rest of the Sandovals dispersed. Chris and I were alone.

"Are you all right?" she asked.

I nodded. Her concern surprised me; I'd have thought her attention would be elsewhere now.

"He'll be back," I said. "He can be terribly vengeful."

She nodded and watched me make looping patterns in the dust with my foot. "What are you thinking about?"

"Actually, I was wondering why you've taken such an interest in me."

She turned serious. "All my relationships have been with short-timers, Glen."

"Short-timers?"

"It's the word we use. Would you rather I said *Homo sapiens*?"

I shook my head.

"My sisters disapprove of my preferences. But my brothers have never appealed to me." She looked thoughtful. "I think it's physiological. There's an unavoidable metabolic penalty with my father's treatment. Protein synthesis requires about 5 percent more energy than it should—because of the compusome validation process. It's noticeable. My brothers don't have your fire." She looked past me into the shadows. I saw her shiver. "The way you burn yourselves out so quickly, like candles . . ."

There was something terrifying in her words. Was that the price? Did we have to give up that much of our humanity—our energy, our passion—to ensure our survival? It felt true. Survival never comes cheap. Still, I wasn't sure. Chris could be stubborn and hot-tempered—she'd just proven as much. She had flaws.

I watched her without speaking for a moment. A stray beam of light struck her hair and made it shimmer. I had to look away.

"Your liaisons with short-timers," I said hesitantly, "they're necessarily . . . brief?"

She gave me a small, sad smile. "Necessarily."

A nod was all the gallantry I could manage. I felt empty and discarded. I'd betrayed my own people for her—for one night with her. And, really, I could hardly have hoped for anything else. There was no sense in deluding myself: I'd understood the situation perfectly from the moment I found the checksum in her genes

My body ached. But I felt a curious sense of peace. Then suddenly I felt too hot to stand still. I walked up to one of the machines and, impulsively, yanked off the tarp that covered it. Dust billowed.

"Was this your father's equipment?"

Her eyes widened; her skin flushed slightly. "Yes."

"Does it still work?"

"I don't know."

She touched the self-test button as if it were white hot. Lights cycled on the front panel and the machine began to hum busily. I smelled an ozone tang. I moved on to the next machine and stripped off its chrysalis. She followed, rousing sleeping sequencers and centri-

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fuges and cytometers. When we'd circled the warehouse we stopped, very close together, breathless from the heat and the swirling dust.

She whispered: "Glen?"

"Yes?"

"Teach us to be more like you?"

I didn't answer. I looked into her open, innocent eyes and thought about how the world was about to change forever. I noticed details: the darkness of her hair, the sounds of her machines, and the barely perceptible flicker of their multi-hued lights on the curves and hollows of her perfect face. ■

IN TIMES TO COME

● Lois McMaster Bujold leads off our February issue with another tale of Miles Vorkosigan. In this one, "Weatherman," the young Miles finds himself with a "character-building" assignment at a meteorological station. Sounds simple enough, except that this planet *really* has *weather!* And since part of the problem is some of the people assigned to solve it. . . .

The rest of the fiction includes an Ian Stewart novelette that's a bit more serious than his usual, and one by Ray Brown that may or may not be intended partly to poke fun at certain literary types we've all known—but in any case, certainly shows Ray's usual offbeat ingenuity. There will also be stories by Jerry Oltion, W. R. Thompson, Jack Wodhams, and (if the puzzle pieces don't shift too much between now and then) a "Probability Zero" by Timothy Zahn. Plus a fact article by Stephen L. Gillett, Ph.D., on "Worldlets in Collision"—a topic of more than casual interest to any inhabitant of this Solar System.

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Lee Goodloe and Jerry Oltion

THE BASELINE PROJECT

Sometimes research seems like a game,
with all the connotations that implies.
But sometimes it imposes much
larger responsibilities. . . .

Dell Harris

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Ellen Jennings stared wearily at the latest figures on the monitor. The residuals were still wrong. Worse, this latest run had pushed them even further out of agreement with A.J.'s hypothesis. And with the meeting coming up in two weeks. . . . *Why* did A.J. want to submit this abstract now? He knew it was too far ahead of the data. She stared again at the screen, as though the numbers might change by the sheer force of her will.

"Hey, Ellen!" She looked up in reflexive irritation at the interruption, even though she recognized the voice. Jack Nagata had stuck his head in her office.

"Huh," she grunted.

"A bunch of us are going out for a beer at the Athenaeum. Wanna come along?" He looked in closer, picked up on her mood. "Hey, kiddo, what's the matter? Heavy science got you down?"

She smiled then, faintly. "Heavy's the word for it, all right. I'm still banging my head against the damned data analysis for A.J.'s abstract. He wants to make the Baseline residuals mean something, and I can't get them to make sense. I can't even convince myself they're real."

"So all the more reason to come to the Ath. Help restore your perspective. Too much science is bad for your health."

"I don't have *time* to—"

"Go crazy. Not for A.J.'s project."

That brought out a full-fledged smile, but it faded quickly. "I don't know, Jack. I really should keep working on this."

Jack looked at the screen, then back to Ellen. "Don't take this wrong, but you're getting a lot of nothing done right now. Come on. Lighten up. Hit it fresh in a few hours and you'll be amazed at how much easier it'll be."

Ellen wavered on the edge. "You'll explain this to A.J. if he sees me over there?"

"Explain what, that you went out for a beer? Ellen, he's your adviser; he doesn't own you!"

"I never said—oh hell." With sudden resolve she pushed herself back from the desk. "All right, let's go."

The Ath was crowded, as usual in the late afternoon. Ellen and Jack threaded their way between dark wooden tables and benches through a throng of laughing and expostulating scientists and students to the corner where the astronomy crowd had staked out a table. A half-empty pitcher stood on the table, along with an empty one; they had some catching up to do.

"Ellen, if I didn't know better I'd say you looked like you'd just flunked your orals," said an undergrad named Gary as he scooted down the bench to make room for her and Jack. He slid two empty mugs expertly down the table to stop in front of them.

"Thanks," she said. She let Jack pour her mug full and thanked him, too—one of the things she liked about being female in a society that once again recognized the differences between sexes was the way she could buy small favors with a smile and a thank you—and added for Gary's benefit, "I've just been crunching numbers for A.J.'s talk. The Baseline probes aren't quite following their predicted trajectory, and he

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thinks it might require modification to general relativity."

Somebody down the table snorted something, the only words of which Ellen heard were "systematic error."

Ellen shrugged. "Could be. I'm trying to see if it's that or if it's real." She absently traced a scratch on the tabletop with her fingernail. "But A.J.'s already written an abstract, and he's trying to get it into the next AS meeting. He's calling it 'Baseline Data Suggest Revision to the Theory of General Relativity,' or something equally modest."

"I thought a working principle of scientific investigation was to first make sure the phenomenon was real before you tried to explain it," somebody else observed.

Ellen shrugged again. "A.J.'s got more experience than I do. He probably knows what he's doing. And anyway, he's the boss. Besides, that's where my funding's coming from."

Jack rolled his eyes. "If A.J. really wanted a long baseline to test the structure of space, he'd pay more attention to calibrating the period-luminosity law. When we get some good trig distances to a few Cepheid variables, we'll be able to get much better distances to other galaxies. And that'll give us a *much* bigger framework for space-structure measurements."

Ellen grinned then. "I won't argue, Jack, even though you're preaching again. Thesis topics do that to people."

Jack reddened, and she continued. "In A.J.'s defense, we do have to keep tweaking the Baseline positional data, whatever else we do. That's where our funding's coming from, and it's iffy enough as it is. Besides which, the *Starwisps* need the best distance data we can get. If we're just a bit off, they might come to a stop 100 AU or something away from the target star. Which would be embarrassing. And even besides —er—" she grimaced "—the abstract's already in the mill."

She downed her beer and held out her mug for another. While Jack poured, she said, "Ah, well. Science lurches onward, I guess."

"Yes," said Alex Jayaraman into the telephone. "Yes!" he said again. "I *know* it's late, Jim, but it seemed important enough to send in the abstract anyway."

In the next office, Ellen stopped keying in data to listen.

A pause. "I *know* it's speculative, Jim. But if I had more data I wouldn't be submitting a late abstract! I'd have a manuscript off to *Physical Review*."

A brief pause. "Surely you can squeeze *one* more measly abstract into the session."

Pause. "I *know* they all say that, Jim. But, dammit, I don't make this a habit. I don't expect to revise general relativity very often."

Another pause. "OK, OK, I won't, either."

Pause. "Yes, and thanks, Jim. I think you'll find it worthwhile. See you at the meeting. Bye."

Now would come the squeak of A.J.'s office chair as he turned around to his terminal to log the phone call. Sure enough. Squeak. Tap tap. Click.

Silence. Squeak. Footsteps. Ellen bent to her work again.

"Did it!"

Ellen looked up as if startled. A.J.

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stood in the doorway, beaming. "I got the abstract into the AS meeting."

"Yeah?" she answered noncommittally.

A.J. shook his head. "Don't be so skeptical. The data's shaping up fine. I've been checking it as you go along, and I'm sure we'll have it whipped into shape in the next few days."

We, kimosabe? Ellen felt like asking, but she held her tongue. A.J. was the man with the grant money; without him she'd be out of a job, and maybe out of school as well.

A.J. didn't wait for a response anyway. He turned to look out the old-fashioned wood-frame window in her office. Ellen knew what he saw out there: two bright comets hung just above the geological sciences building across the courtyard. She'd been watching them rise, thinking how beautiful they were, and how unprecedented it was to have two in the sky at once.

As if reading her mind, A.J. hrummphed loudly. "*Comets*," he snorted. "Pretty lights in the sky, nothing more. *Real* astronomy lies in determining the structure of space itself, not the objects that fill it."

He turned from the window, his eyes aglow. "We'll be famous! Dirac, Dicke, Thorne, Hawking . . . all the great theorists speculated on revisions to general relativity. Now we have the evidence!"

"Maybe," Ellen ventured diffidently. "I hope so." She knew as well as he did their funding problems would be over if he'd really made a fundamental discovery.

"Hah. It's there. It's a real phenomenon." He turned back to the window and the comets. "I take it back," he said suddenly. "Comets aren't totally useless. These'll make an appropriate omen for our discovery."

He was almost right.

Six probes coasted into extraplanetary space along three mutually perpendicular axes. The direct descendants of the Voyagers and Mariners of the previous century, they were yet another of the robot scouts humanity sent ahead on its fitful expansion beyond its home planet; this time, in the first tentative steps to the stars.

Each probe looked like a cartoon undercover agent's surveillance van: an oblong tank bristling with telescopes and radio dishes, all aimed suspiciously in separate directions as though fearing ambush. At irregular intervals tiny thrusters puffed with exquisite precision as a hairline thread of antiprotons lanced into hydrogen fuel. The main telescope would then pivot obediently to look at a new object, while the three auxiliary telescopes remained fixed on three quasars, reference points so distant they could be taken as stationary no matter how far the probe flew.

They were the Baseline probes, so named because they were expanding the baseline by which we measure interstellar distances.

Close one eye and hold your finger in front of your face, lining it up with something across the room. Now look at the finger with your other eye. Your finger is no longer lined up with the distant object; as seen from the different perspective of your other eye, it seems to have shifted. That apparent shift is parallax, and by knowing the distance

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between your eyes (the baseline), measuring the apparent shift, and doing some simple trigonometry, you can calculate the distance to your finger.

Of course, there are easier ways to measure the length of your arm. Trigonometric parallax is most useful for measuring distances where there *is* no more direct way. Distances to heavenly bodies, for example, and to the nearest stars, in particular.

But the baseline between your eyes isn't wide enough to produce an apparent shift in a star's position. Two sites on opposite sides of the Earth aren't even far enough apart for that. The width of the Earth's orbit around the Sun—two astronomical units, or AU—is just barely wide enough to produce measurable parallax in the nearest stars, and even then the distances calculated are crude, accurate to within only a few percent. For a truly useful measurement—one accurate enough to allow sending a probe on an interstellar journey—the baseline needs to be much bigger.

Consider this: The nearest star to the Sun is over 260,000 AU away. Even 1% uncertainty in that distance puts it somewhere along a line 2,600 AU long, or about 65 times the distance between Earth and Pluto. The chance of bringing a probe to a stop anywhere within the target solar system, using a distance measurement so inaccurate, is vanishingly small.

The Baseline probes answered that problem. Already beyond the orbit of Pluto and still moving outward, they provided the extended baseline needed to pin down the distance to Sol's closer neighbors. Simultaneous observation of the same star taken with each probe's main telescope provided parallax measurements far more precise than could be taken from Earth, and the farther apart the probes got, the more precise that measurement became. There was a second advantage as well: the measurement was instantaneous. There was no six-month delay while the Earth plodded around to the other side of its orbit. As the baselines grew, too, the probes could measure the first-ever parallax distances to far more distant objects: intriguing variable stars, nebulae, and other exotic objects for which the pathetic 2-AU baseline provided by Earth's orbit is woefully inadequate.

In a perfect universe, the Baseline probes would trace out an ever-expanding regular octahedron, a growing jewel centered on Sol. Of course, the jewel would grow more and more slowly as the Sun's gravity slowed the probes' advance, but it would remain geometrically perfect since the Sun's gravity is uniform in all directions.

It's never that simple, though. Even the best thrusters don't have infinite precision, nor is the Sun the only body with a gravitational field in the universe. So the probe's trajectories deviated slightly from the ideal path, and those deviations had to be measured and accounted for.

The problem was, the numbers never quite zeroed out. No matter how many refinements Ellen made to account for the planets' gravity, speed-of-light lag between probes, Doppler shift in the signals, and so forth, the probes' actual positions still didn't match the theoretical predictions. There were residual errors left in the theory, and those re-

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siduals were driving A.J.'s reevaluation of general relativity.

They were also driving Ellen nuts, but that's what graduate students were for. So she thought, anyway. And so thought A.J., almost definitely.

"Repent! The end of the world is at hand! Repent!"

The speaker, in a dark coat and tie, sweat collecting on his face, stood beneath a sky aglow with filmy light. Across half the sky, from horizon to zenith, flamed the coma and tail of Comet Gomez-Tolstaya, easily visible even from a city walkway between tall buildings. As the comet neared its closest approach to the Earth, even the astronomically illiterate could watch its head move from day to day, or even over the course of a single night. Comet Chin wasn't so spectacular yet, being still beyond Mars's orbit, but it, too, was a brush stroke of light overhead for those who knew where to look.

"The sign of the Day of Judgment is here! God has provided a sign even the dullest can see! Repent!" The speaker waved a handful of crumpled pamphlets at his audience as if he might smite them with repentance, if only it were within his power. He was working himself up into an emotional froth; the sweat on his forehead was collecting into beads, and his tie was coming askew.

A crowd had gathered to watch the harangue. Most wore expressions of amusement, and most of those continued walking on their way after a few seconds, to be replaced by other equally skeptical passersby, but a few listened earnestly. Their expressions showing open fear, they huddled closer, forming a core group to whom the speaker preached. At one point a well-dressed young woman, by her attire probably an office worker in one of the buildings nearby, collapsed to the ground, twitching and writhing and uttering incoherent noises. Her neighbors barely noticed, so intent were they upon the sidewalk preacher's message.

"The end of the world is at hand!" he screamed again.

He, too, was almost right.

Ellen centered the crosshairs on the image and clicked the mouse. Another set of coordinates got squirted off to the computer. She'd assembled a set of best-fit digital images, composites of the same objects photographed at different times by the Baseline probes, to see if there were trends in their distance measurements. It had taken a lot of hassle—and a *lot* of computer time—to integrate the different data sets. She hoped it would be worth it.

She thought sardonically about how A.J. would have rhapsodized about the good old days, when men were men and astronomers measured positions with real live mechanical measuring engines from real live photographic plates. That took *skill* to get good results, he would say. It gave you an *appreciation* for your data. Not like you kids nowadays, who just play with numbers on a screen like a video game. And so on.

Ellen thought wryly about the systematic error in *that* setup. A measuring carriage gliding mechanically along a "precision" screw, the operator reading a vernier or counting revolutions of a *crank*, for chrissake! It practically took

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witchcraft to get repeatable results with such a kludge. Good ol' days, indeed.

And then she had another thought: If the star positions she was entering now had been measured on a mechanical measuring engine, even A.J. couldn't have found significance in their deviations from expected values. The residuals would have been buried in the noise. Sometimes better data made life more complicated.

Click. Another position stored. She sighed, only half her mind on the measurements.

Julia Irving peered eagerly into the eyepiece of her homemade reflector. *Be shifted*, she thought. *Please, dear God, let it be shifted tonight*. She adjusted the focus, looked off center so the most sensitive part of her eye could scan the field of view, and held her breath so she wouldn't jiggle the scope. Where was it?

The sky was still pretty light and Orion was still close to the horizon, which meant she was looking through a lot of smoggy air. She might have to wait another hour or so before she could see anyth—

No. There it was. And completely on the other side of her reference star. It had moved! It was a comet; it had to be. Comet Irving!

Comet Irving? Well, maybe she could get them to use her first name.

But they wouldn't use either of her names if she wasn't the first to report it. Almost tipping over her telescope in her haste, not even caring if she did, she ran for the house and the telephone. Who did you call to report a new comet? Maybe someone at the Institute would know.

Not isotropic? But space has *got* to be isotropic! Ellen shook her head and looked at the data again. Sure enough, after this latest round of number crunching, the only position discrepancies were for the $+X$, $-Y$, and $+Z$ probes. The other three were right on track. That was a minor miracle in itself, to have finally matched their theoretical positions to their actual ones, but what was this with the other three? They were still off, all right, just as A.J. had predicted, but if the discrepancies were due to subtleties in the structure of space, the subtleties were all on one side of the Sun—which made no sense. That meant it was probably just some systematic error in the instruments; which she'd now have to track down.

She snorted disgustedly. *That* wouldn't please A.J., especially after the hassle he'd gone to to get the abstract into the meeting. She imagined it: *Sorry, it was just an experimental error*. . . . How to look like an idiot in front of your colleagues! At least, if it came to that, she wasn't first author, but still . . .

She suddenly became aware of the telephone chiming down the hall. It had the particular echo Ellen had come to recognize as the departmental secretary's phone. How long had that been going on? Minutes, it seemed, now that she thought about it. But who would be calling the main switchboard after hours?

She picked up her own receiver and punched the button to answer the main line. "Hello?"

"Hello!" a breathless voice panted. "Thank God you answered. My name's

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Julia Irving and I've discovered another comet near Orion! Who do I call?"

"Another comet?" Ellen asked stupidly, trying to shake the residuals out of her thoughts. "Are you sure?"

"It's got to be. It's a little fuzzy speck just like Gomez-Tolstaya was at first, and it changed position between last night and tonight."

Fuzzy speck. Changed position. That did seem pretty straightforward. "Could be a comet, all right," Ellen admitted. "Jesus, three at once! That's crazy."

"Who do I call? I mean, I may be the first person to see it, and if I am they'll name it after me, but I don't know who *they* are. Do you?"

Who indeed? Ellen tried to think. Kitt Peak? Or—yeah. "I think it's the Smithsonian's observatory in Cambridge. You have to send them a telegram or something to establish priority."

"A *telegram?*"

"Right. *Don't* tell anyone else about it till you get the official notification off, either. Otherwise somebody could steal your priority." Ellen paused, thinking. "Look, I don't want to waste any more of your time. Call the Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. They can tell you what the reporting procedure is. Using information would probably be just as fast as me trying to find the number for you, but I'll dig around here while you're trying just in case. If you can't find the number quick, call back, OK?"

"Smithsonian Astrophysical Observatory in Cambridge, Massachusetts. Got it. Thanks!" Julia's excitement kept her voice breathless.

"Any time. Good luck."

"Thanks. 'Bye."

Ellen slowly put the receiver back in its cradle. Three comets in the sky at once. *Wow*, she thought. The odds against that must be astronomical. Hah.

She wasn't even close.

Half an hour later, Jack burst into her office, shouting cheerily "Ellen! I did it!"

She started, and then turned around. "Oh, hi, Jack. Did what?"

"I recalibrated the period-luminosity law! It worked better than I thought possible. With the precision trig distances to the Cepheids, a lot of the scatter goes away in the curve, and what doesn't go away correlates with the age of the Cepheid. I mean, we're talking precision potential here! Globular cluster distances to within a few tens of parsecs. Just think! We can map the galactic structure, uh . . ." he faltered to a stop under her laughter.

"What?"

"I'm sorry. It's just so cliché. The brilliant scientist leaping from the bathtub, shouting 'Eureka!' I think this is the most excited by sheer numbers I've ever seen you get."

He grinned. "Hey, numbers can be sexy sometimes." He watched Ellen's smile fade, asked, "What's the matter? Yours still not making sense?"

Ellen nodded glumly. "Or, maybe I should say, making too much sense, in the wrong way. I've convinced myself the residuals are real, but I've also about convinced myself they've got to be in the instruments. They're all on one side! So, since they're so asymmetric, it looks like it *has* to be some sort of weird systematic error. But if that's what it is, we're going to look pretty silly." She

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sighed. "Especially after A.J. begged the program chairman to take a late abstract. Just what I need: a reputation as a sensationalist before my career's even started."

Jack patted her shoulder. "Don't worry, kiddo. Everyone will blame A.J. for going off half cocked, and they'll pity his students. It won't come back to you."

She smiled weakly. "I hope not."

"You know what you need? You need a break. And I want to celebrate getting some sensible results." He hesitated, an unusual thing for Jack. "I, uh, I've got some makings for Mexican food, and I make a mean *posole*. Would you like to come over to my place for dinner?"

Ellen turned all the way around in her chair to looked at him straight on. "Jack, I do believe you planned this."

He blushed slightly, but shook his head. "Aw, c'mon Ellen," he said, with a twinkle in his eye. "How could I know my data would work out right this evening?"

Ellen looked back to the mess on her own desk. "You're right. Results are the product of random chance." She stood up, made after-you motions to Jack, and added as she turned out the light, "Hard work sure doesn't seem to affect them any, that's for sure."

The senator looked up from her decaf to see her colleague threading his way over to the table. She stood up and held out her hand.

"Hi, Mike. Thought for a while you weren't going to make it."

"Hi, Jenn. Just got tied up. The same thing happens on your side of the aisle, I'm sure." He grinned.

She grinned right back. "Less often, though. We're a lot better organized." She picked up the banter easily. That was how the game was played. These work dinners were for open discussion, where possible deals could be batted around informally with no on-record commitments and no potential embarrassments should things go awry, but they were still just as highly formalized as on-floor debate.

The ritual jab over with, Jenn waved at the waiter who'd been hovering in the background. The two senators ordered, and began the long process of narrowing down on the issue that had brought them together.

Later, over spinach salad and mineral water, they cautiously broached specifics. "Look at this Baseline project for instance," he said. "What good does it do us? Five billion dollars to find out how far away the quasars are, for chrissake . . ." His presentation was subdued compared to the public version. He was dealing in private with a colleague and a professional, and grandstanding was considered bad form.

She shrugged. "That's water under the dam. It's already paid for and the probes are already launched. All we're spending for now is maintaining the downlink."

"And funding every little pissant professor with a computer who wants to fiddle with the data. I say we cut 'em off. Not shut down the probes; that would be political suicide after we spent so much to put them there in the first place, but we can at least tighten the belt on all these grants."

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She nodded slowly. "All right, I'll buy that. So we cut some millions there. We can probably get away with that." She looked expectantly back at the other senator. "While we're on the space program, I've got a few suggestions of my own. This heavy launch booster, for example . . ."—she sketched a few numbers on her napkin—"we could cut out several *billion* here. . . ."

Unfortunately—or fortunately, depending upon the point of view—the universe doesn't listen to political realities.

Jack lived off-campus, in a tall apartment complex off Del Mar Boulevard. They walked there together, the semi-tropical vegetation of southern California fragrant in the cool evening air. Jack spoke to the security gatebot and they walked through, clicking the ornate black-iron grill closed behind them. They entered the elevator and Jack spoke in a tone of command: "Twentieth floor."

"So high? In *California?*" Ellen asked, only half in jest.

"Don't worry," Jack laughed. "This was built after the '04 quake. If anything's safe, it is."

At his apartment, Jack pressed his thumb into the lock to let Ellen in. He guided her over to a large form-fit loveseat that faced the windowall at the back of his apartment. "Here. Have a seat and I'll get drinks. Window clear." At his command the entire wall obediently became transparent, framing the two comets blazing across the night sky. He continued, "Wine? I've got some exquisite Riesling from Washington state." He produced a bottle from beneath the bar.

"Sure, thanks. That sounds good." Ellen remained standing, gazing idly out the windowall, south toward Los Angeles. "Quite a view you've got," she remarked.

He glanced at the comets as he brought over the goblets. "I arranged it just for you!" he said with a grin, handing her the glass.

She took it, sniffed, then sipped appreciatively. "How do you afford such good wine on a grad student stipend?"

He laughed. "I don't. My folks send me care packages now and then."

"Ah. I should be so lucky."

Jack raised his glass in toast. "To thoughtful parents."

Ellen clinked glasses with him, then sipped her wine, looking outside again. The view out there was hypnotic. She couldn't keep her eyes from it. "To think," she said, sitting on the couch, "closest approach to Earth isn't for another week yet."

"Makes up for Halley's," Jack said, sitting down beside her. "My folks still complain about that." He snorted. "That's how I got started in astronomy, you know? My dad bought an eight-inch Celestron just for watching Halley's comet, then was so disappointed he just stuck it in the attic and forgot about it. I found it when I was seven, and the rest is history."

Ellen started suddenly. "Hey, I forgot to tell you; an amateur astronomer called the department tonight, said she'd found a third one in Orion. Can you believe it? Three comets all visible at once?"

"You're serious?"

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"I haven't looked myself, but she sounded sincere. I told her to call the Smithsonian."

"I'll be damned. Must've been a big perturbation in the Oort cloud a while back."

"Hmm," Ellen said, half listening, sipping the Riesling.

"That's the theory, you know. Millions of comets just hanging out anywhere from a hundred AU or so, all the way out into interstellar space. Some gravitational phenomenon or other stirs up their orbits, and some of them get sprayed in the direction of the inner system."

Suddenly what he was saying penetrated. Thunderstruck, Ellen shouted, "That's it!"

Jack, startled and trying to keep his wine from spilling, said, "Huh?"

"That's it!" Ellen said again. "Gravity! Just an ordinary perturbation. And we were so hyped on the glamor interpretation we didn't see it."

Jack was tracking now. "Your residuals . . . could be gravitational perturbations from some dark body. Sure."

"Yes. It fits! Ha *ha!* That's why the perturbations are only on one side. The other three probes are much too far away to feel any acceleration. It fits!"

Jack laughed. "A.J.'s not going to like that interpretation."

Ellen hesitated momentarily. "That's true—although a dark, massive body so near the solar system is a pretty glamorous interpretation itself."

"Not when he's already committed the other one to an abstract."

"Well, maybe not." Suddenly she looked unsure again. "But the whole perturbation business rings a bell. . . ." She frowned momentarily. "Wasn't there a hypothesis about a dark companion to the Sun that periodically knocked out comets? I remember reading about it once."

Jack sighed, his hopes for a quiet, romantic evening obviously destroyed. "Yeah, I remember something about that, too." He got up and walked over to his PC, sat down again, and gave it his thumbprint. Ellen got up and watched over his shoulder.

A menu came up on the display. Speaking the commands with the ease of long practice, Jack directed the system to carry out a literature search, technical literature only, cross-referenced on the keywords *comets, perturbations, Oort cloud*. The hypertext program would chain references together using those words. They waited for a minute or so, then the screen filled with titles.

"Ah, here we go. A whole slew of papers back in the '80s and early '90s." He clicked the pointer on a title, read for a few seconds, clicked on a key word from the abstract, read for a few seconds more, clicked again. Ellen, without the mouse in her own hand, couldn't keep up, but she got the gist of where he was headed through the maze of papers.

After a few minutes, Jack nodded and said, "That's right. Some paleontologists thought they found a periodicity in extinctions, so then some astronomers postulated a dim solar companion in a highly eccentric orbit that would boot lots of comets out of the Oort cloud every few million years. Some of those comets would make it into the inner system where a few would collide with Earth, presumably causing the extinctions. They even named the companion

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'Nemesis,' although it was always highly hypothetical."

"I remember now," Ellen said. "They taught it in General Science back in high school, as an example of jumping to conclusions. Turned out the extinctions weren't periodic after all."

Jack nodded. "And Nemesis's postulated orbit turned out to be unstable. So the hypothesis dropped from sight." Jack shook his head. "So much for periodicities. There's two things the human mind likes to fit through data: straight lines and sinusoids. Both are a lot more common in models than they are in the real world."

Ellen said, "Well, there could still be stochastic perturbations. Maybe dark bodies—brown dwarfs or rogue planets or whatever—pass close enough once in a while to cause a comet shower. There's lots of dark mass in the Galaxy. . . . that was shown years ago from the rotational dynamics." Another thought struck her. "Jack, this could also be the first *hard* evidence for the form of that dark mass in the Galaxy! That would be glamorous. Maybe even glamorous enough for A.J."

She whacked her forehead. "But the meeting's less than a week away. I'm going to have to reanalyze all the data. I need to constrain mass and distances; if *this* hypothesis is correct, we should have enough independent data to get a consistent solution. I'm going to have to go back to the lab right away."

"Somehow I knew that was coming."

Ellen paused. What was she doing? She didn't want to disappoint Jack any more than she wanted to disappoint A.J. But she could see no way clear of it. "Sorry," she said. "I know it's not quite the evening you'd planned."

He managed a faint smile. "We all have priorities. My male ego wishes I was ahead of research on your list, but the rest of me will respect you more in the morning this way." He turned the computer off and stood up. "Maybe I could help you with some of your crunching. My own stuff is under control, at least for the time being."

She planted a kiss full on his mouth, quickly, catching him by surprise. "Thanks a lot, Jack. You're a dear."

Jack looked momentarily startled, then pleased. Smiling, he asked "But could we at least have dinner first?"

Ellen hesitated outside A.J.'s office. She could feel her enthusiasm draining away in contemplating his reaction. She and Jack had come up with a set of consistent solutions for a dark perturbing body, ranges for possible masses, distances, and positions. But even so, when it came down to pointing out to A.J. how he'd blown it so badly. . . .

She finally knocked. A.J. wasn't one of those people who kept his door open.

"Yes?" the familiar brusque voice answered. "What is it?"

"A.J., it's Ellen," she said. "I've got some final answers on the residuals."

"Oh, Ellen, good! Come in."

She hesitated briefly again, swallowed hard, and turned the doorknob. Damn, why did A.J. intimidate her so? She *knew* her numbers were good! Taking a deep breath, she opened the door decisively and walked into his office. A.J. was a much neater housekeeper than most academics; he actually had

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a few available surfaces in his office, including one empty chair, that weren't piled high with books, printouts, and other office flotsam. Ellen sat down in the chair and hunched forward to meet A.J.'s gaze across his desk.

"Well . . ." she began. Mentally cursing herself for her timidity, she nonetheless approached her results obliquely. "To resolve the residuals, I did a least-squares fit to all the data. . . ." She gestured at the terminal on his desks. "It would be easiest to just show you what I did."

A.J. obligingly swiveled the monitor and handed her the mouse. She paged through, showing how she'd integrated all the data sets.

"What I found," she continued, "is that the residuals are all on one side. They can't have anything to do with the structure of space because they're non-isotropic."

A.J. stiffened and looked at her through narrowed eyes.

Ellen plowed doggedly on. "They're much better explained by a dark mass, which is simply applying a gravitational acceleration to them. That also might account for the present comet shower, since this dark body would have perturbed lots of comets out of the Oort cloud, sort of an echo of the old Nemesis hypothesis."

A.J. sat quietly for a minute, staring at the monitor. "Damn," he said finally. "Goddamn it anyway!" Not looking at Ellen, he struck his desk top with his fist.

Ellen winced.

Without another word, A.J. retrieved the mouse and turned back to the monitor. He was obviously reviewing Ellen's data reduction. A good ten minutes went by while he clicked the mouse and muttered curses and Ellen prayed to all the gods she knew that she hadn't made a mistake.

Finally, grudgingly, he said, "It looks OK."

"The dark body interpretation explains the comet shower, and maybe has a tie-in to extinctions," Ellen ventured. "It also may help explain the missing mass problem in the Galactic disk."

"Oh, yes, I'll grant there are some other implications. But those aren't *fundamental* problems," A.J. said dismissively. "They're just details."

Ellen was dumbfounded by his narrow definition of "fundamental" problem. But before she could protest, he continued, "This probably eliminates our chances of any more NSF funding, too. Damn!" he repeated, again smiting the desk with his fist.

He looked out the window, said to the glass, "Looks like there's an open slot for a paper at the AS conference now, too. How would you like to fill it?"

Ellen was completely flabbergasted. "Me? I haven't given a talk at a meeting like that!"

"Well, then you definitely need to practice. I'll have the department put the travel ticket in your name."

And you *won't have to take the heat for changing the interpretations so drastically*, Ellen thought to herself. But she said only, "Whatever you say." After a moment's thought she asked, "Do you have some funding for visuals?"

He waved his hand dismissively.

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"Sure. Just charge it to my account. Talk to the secretary."

He turned back to his terminal. "Now, I have some work to finish."

Ellen found herself shaking as she left A.J.'s office. In part, his reaction had been what she'd expected. What she *hadn't* expected was that he'd accept her results and dismiss them as "unimportant."

Angrily, she thought, *Well, this is as important—not to mention as glamorous—as anything: an unknown dark body right in our own backyard, and it could even have major implications for human survival! What more does A.J. want?*

Well, if she was going to give the talk, *she* would emphasize the importance of this discovery. She could do that much.

She hoped.

Ellen was feeling good as she walked down the corridor outside the meeting room. The jokes had worked; the room had erupted in laughter when she humorously described the change in interpretation from the abstract's version. She'd also finished the talk on time, and she'd even gotten a bunch of questions, especially about that cautious sentence at the end of the talk: "If this hypothesis is correct, it has major implications for hazards to the terrestrial biosphere in the short term." All those practice sessions, with Jack patiently coaching her presentation, evidently had paid off.

"Ms. Jennings?" a voice suddenly asked. She started and looked toward the voice. A tall man, conspicuous by his dark suit among the casually dressed academics, held out a card. "I'm Jim Maggiore, science editor for *Wide World Report*. We do a daily news program and a weekly magazine. If you've got a moment, I'd like to talk with you about the comets you mentioned in your presentation."

"Uh . . ." she began. *Am I supposed to talk to the press?*, she wondered. *Aw, hell with it. A.J. sent me to give the paper; I'll talk with whomever I want.* ". . . sure, I guess so," she finished.

"Great! Is now a good time?"

She shrugged. "Sure."

"Let's go to the press room. I've got all the equipment already set up."

She followed him to a small room at the front of the convention hall, a room crammed with cameras and lights and recording equipment, cables running every which way, all surrounding a corner in which two chairs and a coffee table looked very out of place.

Half an hour later she was still describing the unexpected results from the minor errors in the trajectories of the Baseline probes.

". . . And you think all the comets we're seeing now were kicked out by the gravity from this unseen object?"

"That's the simplest hypothesis now," Ellen replied.

"So, if you're correct, we can expect to see lots more comets?"

"That's right."

"What implications, if any, does this have for Earth?" Maggiore pressed.

That was the question, wasn't it? Ellen answered slowly, carefully, aware of the cameras and the audience beyond them. "It greatly increases the likelihood of a comet hitting the Earth. Depending on the size of the comet, such an impact could be anything from a

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major catastrophe to a cataclysm worse than nuclear war. It's long been thought that major impacts are a cause of massive extinctions. There was even a notion floating around twenty or thirty years ago that extinctions were periodic, due to comet showers knocked out by a dark object in a distant orbit around the Sun. That object was named 'Nemesis,' but such an orbit was later shown to be unstable. The dark object we think we've found here is probably just an interstellar passer-by, but it still kicked out a comet shower."

"A comet shower." Maggiore shivered visibly. "I don't like the sound of that. What kind of probability are we talking about here? What are our chances of being hit?"

"It depends on the time-scale you're looking at," Ellen answered. "If you're talking this year, then it's highly unlikely. Getting hit sometime this decade is a little more likely, but the odds are still against it. The odds of getting hit even in this century are probably less than half, but if the dark body, this 'Nemesis,' slings enough comets our way, eventually one will get us. And the problem with playing the odds is that it *could* happen anytime. It might not be for a thousand years, but it might be the very next one. You never know which it'll be."

"You're saying we *will* be hit? Not maybe, but definitely?"

Ellen tried to be precise. "Over the course of geologic time, the probability approaches certainty, yes. There's no predicting when, but the odds are much greater during a comet shower."

"How long will the shower last?"

"We won't know that until we know the path of the disturbing body. That will probably take a few years of careful observations with the Baseline probes. Things move slowly out in the cometary cloud."

Maggiore nodded. "Let's talk about the Baseline probes for a minute. They were designed for measuring distances to nearby stars, correct?"

"That's right."

"They've been the target of budget-cuts and indignant accusations of money-wasting since their inception for that very reason. Many people feel the money could be better spent on projects closer to home. Yet these probes were directly responsible for a major discovery right here in our own solar system. How do you explain that?"

The camera panned to Ellen for her response, and Maggiore winked at her. It was a setup question if ever she'd heard one. Well, Ellen had the answer. Anyone who worked in a scientific field for long knew it.

"It's called serendipity," she said. "Digging for worms and striking gold. Abstract knowledge is *never* useless, and that's what the Baseline probes were primarily sent out for: to gather abstract knowledge about the Universe. It just paid off quicker than we thought it would this time, that's all."

"For which we're all exceedingly grateful. Discovering the comet shower at its onset means we have more time to prepare for, and possibly prevent, a catastrophic collision. Have you any thoughts on that subject?"

Ellen shook her head. "It would all be arm-waving at this point. I haven't had time to study any serious options. But I suspect one way or another we're

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going to have to learn how to move comets around. Or shoot them down."

"I see. Well, Ellen, thank you for your time. It's been a pleasure talking with you. Good luck with your research—and that's heartfelt, from all of us." He held his pose until the camera's winking red light went out, then said, "And off the record, I really do mean it."

Ellen grinned. "Well, keep telling your listeners to support space research! Because—and this is also off the record—we may have a hell of a time convincing anybody this is serious enough to spend money on until it's too late."

Ellen set the phone back in its cradle with a sigh. Ever since that first headline after the meeting, with "SCIENTIST PREDICTS DISASTROUS COMET SHOWER" splashed across the front page, she'd been bombarded with phone calls, requests for interviews, and crank calls till she was in a daze. She leaned back in her chair and pondered this latest communication. They wanted her to talk to the Senate! It was flattering, but she didn't know if she should. . . . A.J. was irritated enough already by the media attention she was getting.

Jack stuck his head in her office. "Hey, how's the celeb today?"

She smiled wearily at him. "Tired. I wish it would all go away. I've just been asked to testify before a Senate committee."

"Hey, Ellen, that's great!"

She sighed. "Not really. A.J.'s upset enough already. I think he thinks I stole his thunder. Yesterday he accused me of 'tawdry sensationalism for the popular press.' This'll really send him through the roof." Turning away, she said, "Oh, I wish I'd just kept my mouth shut."

Jack snorted. "*He's* one to complain about sensationalizing. I guess it's OK if you direct it at the rest of the scientific community, huh? Well I call that hypocrisy. Besides, he told you to give the talk in the first place."

"Jack, he's my adviser. His opinion counts for something."

Jack shook his head. "A.J.'s got a bad case of ivory-tower-itis. He needs to join the real world. What you have is very important, not just scientifically, but for the whole human race! Stop being so damn apologetic about it and get out there and promote. You've got the public's attention; use it to get something done. And if A.J. is silly enough to make a big fuss about it—well, there's lots of fish in the sea. Find a new adviser."

She ran a hand through her hair. "I can't do that. Not in the middle of my thesis work."

"You might have to. Ellen, this is bigger than either you or A.J." She started to protest, but he cut her off. "I know what you're thinking: it can't be that important because it's happening to you, Ellen Jennings. Well listen, kiddo, that's all anybody is. The whole scientific field is just a bunch of Ellen Jennings's and Jack Nagatas and the occasional Alex Jayaraman. We all do our work, and occasionally we find something important. And when we do, we run with it. For personal gain, for the good of science, for the good of humanity—there are as many reasons

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as there are scientists, but we run with it. That's our job."

Ellen looked at him with wide eyes. "I didn't know you felt so strongly about it."

"You pushed one of my buttons." Jack took a few deep breaths, then added, "Ellen, I know how you feel. I'd be nervous too, but this is part of why you're here, whether you like it or not."

Part of her job, whether she liked it or not. Jack was right of course. And for that matter, he'd just told her what to say to the Senate, too.

Ellen fidgeted in the congressional meeting room. *How the hell did I ever let myself get talked into this?* she wondered for the hundredth time. It was a rhetorical question; of course she knew how; she thought it was the right thing to do. She hoped it was; the decision had cost her a thesis adviser, and her status as a grad student was now in doubt.

She furtively checked her portable VCR for the umpteenth time and stole another glance at the committee at their podium, with their staff standing by. On either side of the room stood the television cameras, ready to record her every mistake for public consumption. She reminded herself the questions had been rehearsed beforehand, and she knew what they were going to be. Most of them, anyway. She also reminded herself that most of the questions were just senatorial grandstanding. They all had copies of her testimony already.

Besides, after all those media interviews, this couldn't be so bad. So why was she still nervous?

The previous speaker had wound up his statement. The chairperson of the committee was saying, ". . . and thank you for taking the time to testify today."

The staffer beckoned at Ellen and announced, "We will now hear testimony from Ms. Ellen Jennings, who has discovered a probable cause for the current unusual number of comets in the night sky, and who has speculated upon the implications they might pose for us here on Earth. She is a graduate student at . . ." The staffer rambled on, Ellen only half listening, absorbed in her own thoughts. She sure hoped she was a grad student still, but . . .

"Ms. Jennings?"

Her name jarred her back to reality. It was time. Ellen stood up and walked foward to the table in front of the podium where the senators sat. She plugged the VCR into the jack in the table; her visuals would now be displayed on the senators' individual monitors, and on the public access channel as well. She looked at her microphone and wet her lips. *Well, here goes*, she thought. She launched into her presentation.

And suddenly it was time for questions. She was inwardly astonished; her speech had flowed so well she'd forgotten herself completely. Maybe practice *did* make perfect, at that.

The first question, as customary, came from the chairman, the most senior majority party member on the committee. She shuffled papers for a moment, drawing attention, then said, "Ms. Jennings, the Baseline probes have been traveling for years, and are very far from Earth. From your testimony I gather that the body whose gravity is influencing their course, and which you suggest is

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also disturbing the comets' orbits, is also very far away."

"That's correct," Ellen agreed.

"Then why are we talking as if Earth were some kind of cosmic target? From that distance we must be an insignificant speck lost in the vastness of space."

"We are," Ellen admitted. "And it's true, nobody's aiming anything at us. Most of the comets Nemesis disturbs won't even reach into the inner solar system, and of the ones that do, most will miss, just as comets Gomez-Tolstaya, Chin, and Julia will miss. But when you start talking about thousands of them, even when they aren't aimed directly at us the odds of a collision rise enormously. Think of them as snowflakes in a blizzard. None of them is aimed at anything in particular, but eventually everything gets covered."

"A *blizzard?* Surely that's an overstatement."

"No ma'am, I'm afraid it's not."

That stopped them. Visibly nonplussed, the chairman hesitated for a moment, at a loss for words. Another senator then interrupted. "Madam Chairman, we have not addressed the probability that this whole cockamamie story is mere sensationalism to extract more money from the government for their expensive toys and irrelevant investigations."

"Looked at the night sky recently, Senator?" a third senator asked. Muffled chuckles sounded around the room. Ellen maintained a rigid poker face, but she was thinking how very much a roomful of senators sounded like a roomful of astronomers.

The skeptical one didn't seem to notice the laughter. He set off into an obviously rehearsed speech, with set phrases about "social priorities" and "spending money on human needs" and "limited resources."

By their expressions, his colleagues had heard it all before.

When he was done, Ellen said, "You talk about spending money on human needs. I submit that a potential hazard to our planet worse than nuclear war is a human need that must be addressed with very high priority indeed." A few more chuckles sounded in the room, but she forged ahead. "As for 'sensationalism'; well, all I can say is that the data are public domain, and other researchers who've looked at them agree these interpretations are reasonable. No honest scientist claims the interpretations are certain; that's just not how science works. But all agree the issues are important enough that serious further investigation is required."

"You mean you aren't *certain?*" The senator pounced on that phrase.

Ellen responded patiently, "No, we aren't certain. Science is like real life; you're never absolutely certain, but some explanations are much more reasonable than others, and some consequences are much more important than others." She added pointedly, "If you're driving, and you think your brakes have failed, you check it out right away. Even if you're not *certain*."

Another senator, one who'd been silent until now, spoke up. "I would like to know why now. Why is this happening—if indeed it *is* happening—now? I mean to say, if you'd made this discovery a hundred years ago we would be unable to do a thing about it. If you'd waited for another hundred, we could

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very possibly take care of the problem with an extra radar installation and a surplus cargo spacecraft. Only now, of all the times in our history as a race, would an effort to stop this 'comet shower' require worldwide cooperation and the expenditure of billions of dollars we can ill afford to spend. Why do you suppose this is?"

"I think the answer you're after might require a professor of theology," Ellen replied. "The only one I can give you is that we *have* discovered it now. Call it coincidence, call it dumb luck, or call it divine intervention; whatever you like. That doesn't alter the fact those comets are out there." She paused, working up her courage, and plunged on with the speech she had *really* come to deliver.

"I think the real question here is not so much 'Why now?' as it is 'Why us?' Or more to the point, 'Why this particular Congress?' I can only give you the same answer that was given to me when I asked a similar question: Because it's your job. You're here to serve the people of this nation, and because of our place in the world community, the entire human race. Sometimes that means making hard choices, politically unpopular choices that nonetheless need to be made. This is one of those choices. It's going to take billions of dollars to stop them, but the comets aren't going to go away. You can take a gamble, continue to fund the popular projects and play the odds that we won't get hit until you're safely out of the picture, but the potential loss if you're wrong is more than I'd want on *my* conscience.

"And I believe in the long run it's more than anyone else wants on your conscience, either."

There was a shocked silence as everyone, including the camera operators, wondered who this upstart was, telling the United States Senate how to do their jobs. But they hadn't shut her up, and now the damage was done.

The chairman made a show of consulting her watch. "Excuse me, we're out of time. Thank you very much, Ms. Jennings, for your time today."

Ellen stared wearily at her monitor. *Why* couldn't she get the phrasing right? The proposal was due at NASA headquarters in D.C. in another week, and even though she knew what she wanted to say she couldn't make the words fit together. She was much better with numbers.

Her new adviser had offered her the chance to write the proposal, though, and he'd told her outright he was giving her all the free rein she wanted, not only with the proposal but with the whole project. She couldn't be Principal Investigator, of course, not with only a bachelor's degree for credentials—nor with half the U S Senate mad at her, for that matter—but he was happy to let her use his name as P.I. while carrying out the research herself. He trusted her to know what she was doing, and Ellen had every intention of living up to that trust.

Even if it meant learning to write. She tapped out a few more words, frowned, deleted them, and tried again.

"Hey, Ellen!" She jumped at the voice but smiled at Jack as he bounded into the office. "How goes the proposal?"

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"Slow, but it's going. I think I'll be able to finish it in time."

"You *think* you will? This is your grant application, kiddo! Of *course* you will. First thing tomorrow."

"Tomorrow?"

"That's right, tomorrow. Tonight; you're having dinner at my place. I'm making *posole* again."

Ellen wrinkled her brow in mock consideration. "Gee, Jack, I don't know."

"My parents sent another bottle of wine," he added.

She smiled broadly. "Sold!"

They left the building hand in hand. Comet Julia blazed through the night sky, clearly visible even in smoggy, city-lit southern California.

They didn't even notice. ■

FUTURES

(continued from page 105)

to the edge of goofiness. The opening narration was filled with lots of gobbledygook about hyper engines, etc. before being trimmed to a matter-of-fact explanation of faster-than-light travel and the Space Cruiser's mission. Other cuts show a terrible special effect shot of Robby the Robot transporting the Commander and his officers across a very fake desert. Robby's voice also underwent changes, and the workprint lets you hear his first unimpressive voice.

There are many other interactive goodies at the end of the disc. There are production and publicity stills, and passages from the novelization. You can also access special chapter-stops on the disc devoted to the electronic tonalities, composed by Louis and Bebe Barron, the set and costume design, and the real star, Robby the Robot.

Another, even more classic film has been issued on laserdisc in a good, uncut print. *The Thing From Another World* (Image Entertainment, 6311 Romaine St., Hollywood, CA 90038) is an RKO film that set the mold for malevolent space invaders to come. At once a political allegory and at heart a spook show, *The Thing* was reputedly to be directed by Howard Hawks, rather than the director of record, Christian Nyby. While Nyby did direct the film, he followed the extensive set-ups and blocking provided by his mentor, Hawks.

Previously available in inferior, cut versions, this version restores all the flat, nervy dialogue that does so much to build up the gloomy, claustrophobic atmosphere of the Arctic.

Worth another look is John Carpenter's 1982 remake of *The Thing* (available from MCA Home Video, 70 Universal City Plaza, Universal City, CA 91608). While heavily criticized, the special effects extravaganza features the wildly metamorphosing creatures of Rob Bottin. What many critics didn't realize was that Carpenter's brutal, almost excessive film was remarkably true to the source material, John W. Campbell's 1938 *Astounding* story, "Who Goes There?" ■

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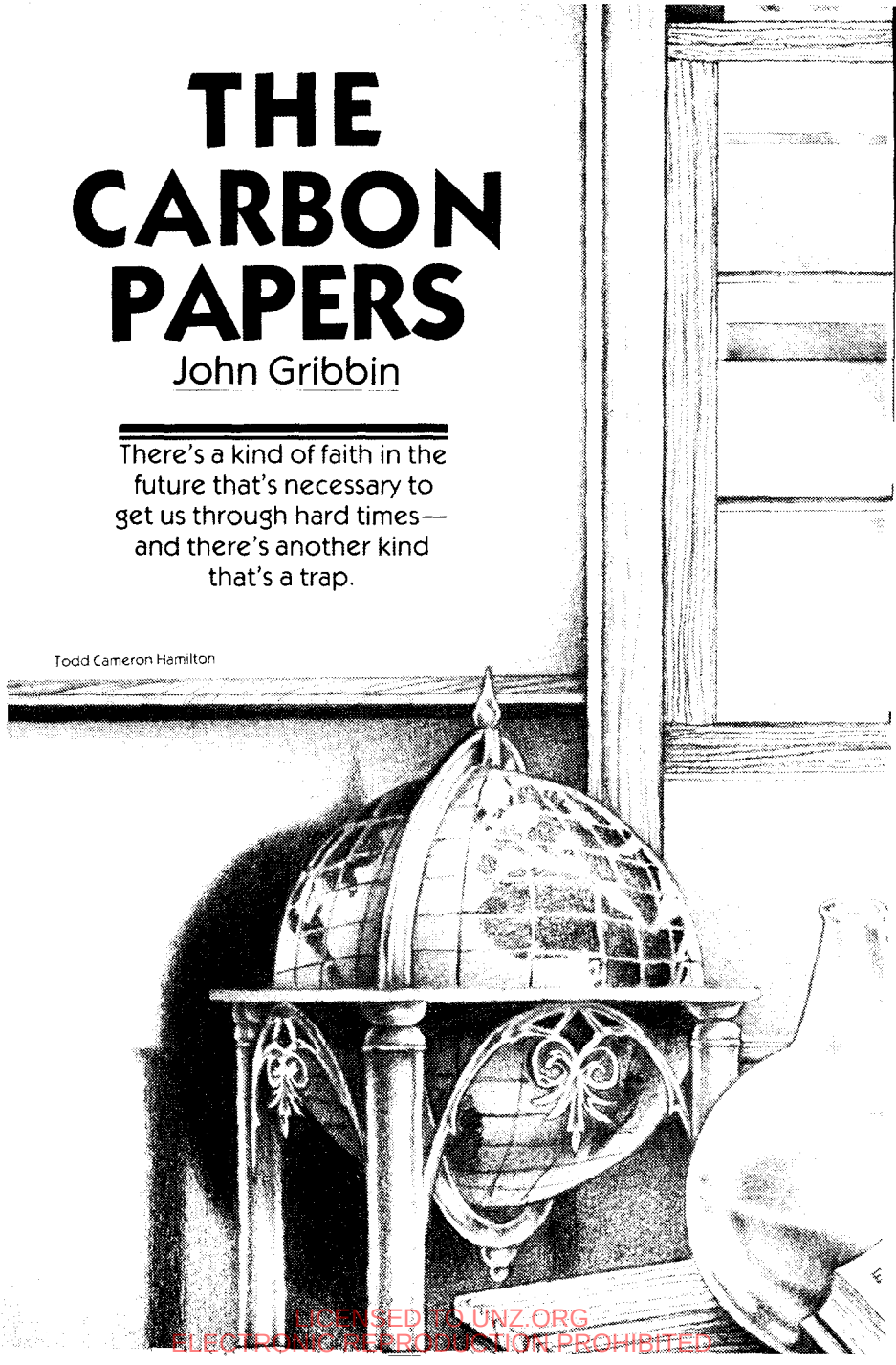
THE CARBON PAPERS

John Gribbin

There's a kind of faith in the future that's necessary to get us through hard times—and there's another kind that's a trap.



Todd Cameron Hamilton

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"Parcel for you." It was totally unexpected. I scarcely ever even get letters, let alone parcels, and it certainly wasn't my birthday.

"For me?" The postman was obviously used to dealing with half-asleep people clutching pieces of toast.

"Name Murray? Right?"

I nodded.

"Sign here."

I did so, and sticking the toast in my mouth for safekeeping, carried the package over to the table. It was sealed with tape *and* tied with string, which seemed to be taking security a little too far. Definitely, a two-handed job to open it. I finished the toast, gulped a swig of coffee, and set to work on the wrappings with the bread knife. The security didn't stop there. Under the first layer of paper there was a letter; and under the letter was another layer of wrapping, an old, brown-paper parcel, secured not with tape but with a genuine—as far as I could tell—wax seal. In fact, two wax seals, securing paper and string, and bearing a claw imprint, written in a circle like a postmark—"Cox's Bank, Charing Cross."

I was late. I didn't want to miss the bus. But I couldn't resist a quick look first. The covering letter was from a firm of lawyers—impressive address, Inner Temple, London. But it didn't say much. They had the pleasure to be my obedient servant, and it was their duty under the terms of some arrangement made in 1890, exactly 100 years ago this week, to convey this package to me, the heir of one William Arrol James, in accordance with the wishes of some old doctor, one John H. Watson, M.D.

I glanced at the clock. I'd probably missed the bus already. And I hadn't learned anything useful at all. Didn't even know I had an ancestor called William Arrol James—though my grandmother's maiden name was James, so he might have been an uncle of hers, assuming they'd got their facts right. It was a big, Victorian family; that's all I ever knew about them, and more than I particularly wanted to know. I had my own life to lead, here, in the present.

It didn't look as if the parcel contained anything valuable. But I was late anyway, so what the hell. The knife did its job on the string, and I managed to lift one of the seals off more or less intact, as a souvenir. The other one crumbled into pieces as I pulled the parcel open. It was full of papers. Some old newspaper cuttings; a sheaf of typewritten pages, with the heading "On the Retardation of Infrared Flux by the Gaseous Carbonic Acid Constituent of Planetary Atmospheres," by W.A. James; and a thick wad of manuscript, handwritten in an old-fashioned but clear style with black ink. I pushed the typescript and the newspaper to one side, clearing a space on the table. Carbonic acid fluxes, whatever they were, were way over my head. But one more coffee and a quick look at the handwritten stuff wouldn't do any harm. It wasn't a letter. It was laid out like a story, with a heading at the top—*The Carbonic Acid Affair*. But it read as if it was addressed directly to me.

In taking up my pen to record the details of the curious business of the carbonic acid affair, I know that I am

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acting against the express wishes of my friend, Sherlock Holmes, and in defiance of instructions from representatives of Her Majesty's Government. But in fairness to the memory of an honest man, whose great contribution to scientific knowledge might otherwise go unreported, I cannot let this matter rest with the official histories of our time. By the time you read these words, the name of William Arrol James will be no more than a footnote in history. Yet if his contribution to science is correct, as I believe it to be, the carbonic acid business will, for good or ill, be part of public debate, whatever the wishes of governments. Honours and recognition may have passed your ancestor by; his life has been cruelly cut short. For this, I must take some of the blame myself. But at least I have the satisfaction of knowing that his heirs will discover the truth, and may even, if they wish, be able to gain some belated recognition for this true genius of the Victorian age.

The affair began in the second week of November, in the year 1889. A dense, yellow fog settled upon London. I had got into the habit of visiting my old friend in the rooms we had formerly shared in Baker Street, at least twice a week. His manner worried me. He alternated between bouts of frenetic activity, and periods of listless torpor that in a lesser man I would have termed laziness. His mind lacked the intellectual challenge of some great criminal case on which to exercise its talents, and I feared that he had recourse, more often than was medically wise, to a 7 percent solution of cocaine. I almost wished that some master criminal would take advantage of the fog enshrouding the city to perpetrate some act to provide a new challenge for Holmes, and to restore him to his old spirits.

Salvation came in the homely form of Mrs. Hudson.

"A young lady to see you, Mr. Holmes."

"At this hour? What do you say, Watson? Shall we receive her?"

"Oh, by all means, Holmes." Nothing could have pleased me more. In my experience of Holmes's affairs, the arrival of young ladies, without prior appointment, at unusual hours was always likely to involve some problem worthy of his mind.

He sighed, and stretched his long legs in front of the fire.

"Very well, Mrs. Hudson. But she must take us as she finds us, if she has any aversion to smoke, then I fear she has come to the wrong rooms."

"The smoke and clutter of a bachelor's rooms are the least of my concerns, Mr. Holmes."

A slight girl, no more than twenty-five years old, and dressed in black which made the red of her hair all the more striking, had stepped from behind Mrs. Hudson and across the threshold.

"Forgive my presumption. But you are the only person who can help."

"Pray, take a seat, Miss—" Holmes stood, nodding to Mrs. Hudson that all was well."

"James. Felicity James." She took the proferred chair.

"And this, Miss James, is my friend and colleague—"

"Dr. John Watson. I have read your booklets, Dr. Watson. *A Study in Scarlet*, and *The Sign of Four*. They are the reason I am here."

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Holmes raised one eyebrow.

"Your fame, Watson, seems to have gone before you." He turned to the girl again. "Are you sure it is I you wish to see, Miss James, and not Dr. Watson?"

"Oh, please both of you, I am sure. But it is you, Mr. Holmes, that is the detective. Only you can help me now."

Holmes returned to his seat. "James. The name is a common enough one, but seems familiar."

"Murder, Holmes." It was my turn to speak. "A straightforward murder, reported in the *Chronicle* this morning." I had been searching out the paper while he had exchanged pleasantries with Miss James, happy, for once, to be ahead of Holmes in something. "Here it is. William Arrol James, shot dead by a burglar he disturbed in his rooms. Nothing there to tax your powers, I am sure."

"But he wasn't." The girl was increasingly agitated, twisting her gloves in her hands, leaning forward in her seat and glancing from Holmes to myself.

"Wasn't murdered?"

"No, no. William is dead. Shot dead. But not murdered by a common thief. He had been in fear of his life for weeks. There was some plot against him. He came to me, to tell me; he made me promise that if anything suspicious happened to him I would not let the matter rest. I thought he was ill, overworking; I took no notice. I told him to rest. But then this happened. And the police say the matter is clear, that the rooms had been ransacked, that William surprised a burglar in the act and was shot trying to apprehend him. But, Mr. Holmes, if that was an ordinary burglar, how could William have known in advance that it would happen?"

"Such things do occur, Miss James. The world is full of coincidences. Had we time, I am sure Dr. Watson would delight in telling you the story of the politician, the lighthouse, and the trained cormorant. But with nothing more than this to go on, we must accept that the police know their business."

"But there is more."

"Ah." He stood and began to pace the room, long-fingered hands clasped behind his back. "I thought as much."

"There are papers." She pulled them from her bag, and since Holmes ignored them, she offered them to me. I read the title aloud; those same papers, together with the newspaper reports of the James murder, accompany this memoire.

"Carbonic acid hardly seems a matter for murder, Miss James. Your brother, I take it, was a scientist; but what is the significance of these carbonic acid papers?"

"My brother, sir, was not just a scientist, but a great scientist. He was older than I am, by nine years, and he had already begun to make a reputation for himself. I know nothing of science, but I do know that he was highly regarded by his peers. Last year, there was talk that he might be elected to the Royal Society by the age of forty. He had set himself upon a course unique in the academic world, or so I believe, the study of the atmospheres of the planets, combining elements of both chemistry and astronomy, and more besides. In scientific terms, William was a polymath—although I must say, in matters

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of the everyday world he could be much more obtuse."

"It is so often the way." Holmes had taken up a position by the window, gazing out into the swirling fog. "The mind is like an attic, with room to store only a certain amount of furniture. Fill it up with science, and there is no room left for anything else. Which is why I have taken such care to avoid learning any science outside of a few items with some forensic value. I leave such things, and those papers, in the hands of Watson, here. But go on—tell us more of your brother's preoccupation."

The story that Felicity James unfolded to us was a queer one, to be sure, but not, on the face of things, a murdering matter. William James had simply reached an impasse in his scientific career. After publishing several scientific papers and a learned monograph on the subject of planetary atmospheres, he had found it impossible to find anyone willing to take on his latest calculations. It was, he had told Felicity, the best work he had ever done, of incalculable importance to the future of mankind. Since she was only a girl, he had not tried to explain the details to her. But he had poured out his frustration at the response of the scientific community. Nobody would publish his calculations. The Royal Society refused to allow him to speak upon the subject; even Lockyer, at *Nature,* no stranger to controversy, had rejected the very papers that I now held in my hand, and at which I peered in, I must confess, incomprehension. This had gone on for months. At last, James had become convinced that there was a plot against him, a conspiracy to blacken his name, and to discredit his scientific work. He had been overlooked for advancement at the university, and no longer received invitations to lecture elsewhere. A broken man, he had poured out his worries to his sister, handed her the papers, and made her promise that if anything untoward happened to him she would see that they were published, somehow, somewhere.

"But I never expected this, Mr. Holmes." By the end of her story, she was dabbing at her eyes with a handkerchief. "I don't care about the papers. You can keep them. But if there was a conspiracy against my brother, I want the assassins brought to justice. You *must* help!"

He turned from the window.

"We will do what we can. Watson, I see, has made a note of your late brother's address. In the morning, we will visit the scene of the crime. But you must rest, and leave all the worrying to us."

"Thank you." She smiled. "I begin to feel better already, knowing that you are taking up the case."

The house was tall and narrow, part of a terrace facing on to a square near the river. If anything, the fog was worse there, with the upper stories of the terrace almost lost from view. I was glad to get out of the cab and inside the building, where we were confronted by a familiar figure.

"Sergeant Bull!"

"Good day to you, Mr. Holmes." He touched a finger to his forehead in salute. "I didn't know you were in on this case."

"Yes, here I am, Bull. But a bit late

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in the day. I suppose everything's been tidied up by now?"

"Mostly so, down here at any rate. But not at the scene of the crime." He inclined his head towards the staircase.

"Up there, eh?" Holmes rubbed his long hands together. "On the top floor?"

"Indeed so, Mr. Holmes. The professor's lab'ratory, they calls it. With a window opening on to the roof, where the murderer made his escape." The stolid sergeant shook his head. "We'll never catch that one, not now. And it hardly seems worth a man's life, the few trinkets he got away with."

"Yes, Bull, I'm sure it's a very sad case. But you don't mind if I take a look around? With my colleague Dr. Watson?"

"Oh no sir. Not if you're on the case."

"Good, good. Top floor, you say? Come, Watson, we've very little time."

I tried to interrogate my colleague as we hurried up the stairs, but he was a flight ahead of me before we reached the top.

"Come, Holmes," I puffed at last, "what is this nonsense? James is dead. Our bird has flown. Why the sudden hurry?"

"I am expecting a visitor. There is no time to lose." His sharp eyes darted about the room. Along one wall there was a long table, which had clearly served the occupant of the house as a chemical laboratory. The usual retorts and tubes were there, some of them smashed, and the remains of what seemed to have been a large glass tank. For some reason, this fascinated Holmes. He examined the fragments of glass carefully, then turned to the floor under the table. There was a damp patch. Removing his glove, he rubbed a finger over the damp wood, and held it to his tongue.

"Careful Holmes! There could be any number of poisons in that brew."

"Not at all, Watson." He shook his head. "Come, taste for yourself. Salt. Nothing more than brine. Just as I suspected."

I followed his example, rubbing the damp patch with a finger and tasting the salty residue of the puddle that had lain there. While I did so, Holmes had crossed the room to the window, flinging it wide and gazing out onto the rooftops beyond. The square below was lost in the fog. I joined him.

"That is where the murderer made his escape, eh Holmes?"

"At least, Watson, it is where the weapon made its escape." He was examining the window frame, carefully: First the bottom, then the sides, and finally the top. He pulled a glass from his overcoat pocket, and peered intently through it at the paintwork just above our heads.

"Look at this, Watson."

I did as he instructed. A deep indentation and several smaller scratches marked the paint work.

"I fear I don't see the significance of this, Holmes. Just a few scratches."

But he had already turned, and was flinging open the cupboards that lined the other wall of the laboratory.

"Those few scratches, Watson, suffice to confirm that Professor William Arrol James was not murdered at all."

"Not murdered? But, Holmes, his sister has identified the body."

"Aha!" He had found what he wanted

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in the cupboard. Some lengths of copper wiring, two copper plates and a series of electrical cells. Quite normal equipment to find in any scientific laboratory. I failed to see why they should be so pleasing to him.

He turned back to me, and, flipping the tails of his coat back out of the way, clasped his hands behind his back.

"Watson, you must have realised, from the story Miss James told us, that murder was the least likely cause of her brother's death. It is given to very few people to know in advance that they will be murdered, and to make appropriate arrangements with their kin. But there is a form of death which is very often planned in advance, and before which the victim usually communicates with his friends or relations."

"Suicide?"

"Exactly, Watson."

"But how?"

"That is what we came here to find out. It was, of course, obvious to me that James had killed himself. But how? And why? As to the former, his profession itself gave me the clue. A chemical meterologist, one of the most brilliant minds of the century, he would be sure to have devised some ingenious trick that made use of his special skills. The brine puddle, the scratches on the window and the electrical apparatus show just how ingenious he was. A sad loss, indeed, to science."

"But Holmes, *how?*"

"You mean you haven't seen it yet? Come, Watson, what is produced by the action of electricity upon a brine solution?" My puzzled expression seemed to exasperate him. He took a pace towards me, thumping his right fist into his left palm.

"Hydrogen gas, my dear Watson. And what is the most important property of hydrogen gas?"

I knew that one.

"Why, of course, it is lighter than air."

"Indeed, Watson. Lighter than air. Suppose, now, that you stood in the room, about here," he had taken up a position by the window, "and you had in your hand a small revolver, attached by a cord to a balloon, full of hydrogen gas, floating just outside the window. If you were to release your grip on the revolver, as you fell with a mortal wound in your temple, what would happen to it?"

"Why Holmes?" My eyes darted from his upraised hand to the window. "If the balloon were big enough, it would carry the revolver out into the air. And on the way . . . "

"Yes." He smiled. "On the way, Watson, it would bang not against the bottom of the window frame, but the top. Once out in the night, it might drift for miles, unobserved through the fog, before the balloon would burst and deposit the revolver in the garden of some astonished citizen. The picture is clear. James killed himself, in such a way as to make it seem like murder, after alerting his sister to the possibility."

"But why would he do that? To avoid the scandal of a suicide in the family?"

"I think not. James, remember, was a scientist. In my experience, such men are little concerned about social niceties of that kind. No, Watson, I flatter myself that James had another motive, and one in which he has succeeded. He

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must, of course, have known of his sister's taste in reading matter. His mysterious warnings to her, and the nature of his death, were intended to achieve one object, apart from his own departure from a world he had found intolerable. Simple suicide would hardly be a matter to attract the attention of one who specialises in the more intricate problems of detection. But murder, foretold, in advance, with a hint of mysterious plots—that, James reasoned, should be sure to attract the attention of the man he wanted."

"Holmes! You can't mean—?"

"But I do, Watson. This elaborate ploy, which has stimulated me out of the lethargy on which you remarked only yesterday, was designed to attract my attention and bring me here to this building."

"But why?"

"As to that," he cocked his head slightly, and I heard the sound of a heavy tread making a measured way up the stair, "I believe that just the man we need to explain the rest of the mystery is with us now. Welcome, Mycroft!" He turned with those words, extending his left arm with a flourish to the door, which now framed the tall, portly figure of Sherlock Holmes's elder brother. I sat down, astonished, on the tall stool alongside the long table.

I knew very little about Mycroft Holmes, except that he worked in some senior and secret capacity for the government. The brothers seldom met, and Sherlock seldom spoke of their relationship. But I had sensed a certain sibling rivalry. If Sherlock Holmes had a genius for detection, his brother was comparably brilliant, in his own way. Now I understood the urgency in Holmes's mind to solve the case before Mycroft appeared. But how had he know that his brother *would* appear?

"I had hoped to find you alone, Sherlock. I have left Lestrade downstairs. I suppose it is too much to hope that Watson and yourself are still in ignorance about this affair?"

"Why Mycroft, we know very little, I assure you. Simply that the greatest scientist of his generation has been hounded to his death, by you, in order to ensure that his studies of carbonic acid vapour are never published; that he committed suicide," the barb, to Sherlock Holmes's evident delight, shot home, and Mycroft gave a little start, "in a manner which Watson will be glad to elaborate on for you later, and that you are here to demand our silence, for the good of the country. You will need to be persuasive indeed, in order to achieve that end. I believe Watson is already planning another of his little books."

I was completely left out of the conversation. I would have to wait until later to find out how Holmes had known of the involvement of government agents in the plot. Although, on reflection, as I sat and listened to the two of them, it became clear to me, as it must have been to James himself, that nobody else could have organised so thorough a suppression of James's work. No doubt Holmes, with his agile mind, had worked that out even before Felicity James had left his rooms.

"If James committed suicide—and if you say so, then I don't doubt that it is true—that may be the best piece of news in all of this affair. No, I don't

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wish such a death upon any man. But we had feared French agents. There are papers missing—''

''We know of their whereabouts.''

''Then that is good news indeed, and I am almost glad to find you here, after all. An explanation is certainly required, but it must go no further than this room. Not even to the ears of Miss Felicity James. You must persuade her, Sherlock, that her brother died at the hands of a common thief, and that his talk of plots was no more than the tortured imagination of a mind pressed too far by scientific labours. It is indeed,'' and here he turned his attention to me, ''for the good of the country.''

''And just what is so secret and important about carbonic acid vapour? How are the French involved?''

''You have put your finger on the nub, Dr. Watson. Allow me to explain. The story goes back almost seventy years. The Napoleonic wars had not long ended; relations with France were even more precarious than they are today. It was a Frenchman, Baron Fourier, who first studied the puzzle of how the world keeps warm, in the 1820s.''

''How the world keeps warm?'' I could not keep silent. ''My dear sir, the Earth keeps warm because the Sun shines upon it! Why, the Greeks knew that!''

''Exactly so, Dr. Watson. But I would be grateful if you did not interrupt. Baron Fourier showed that there is more to the story than this. If you have a little box, with a glass lid, that you keep out in the sunlight for some time, then the air in the box becomes warmer than the air outside. The Baron explained that in the same way the blanket of air around the Earth keeps the whole planet warmer than it would otherwise be. He was beginning to investigate how mankind's activities might alter that natural state of affairs, when he died.'' Mycroft paused, reflectively. Sherlock Holmes stepped into the gap.

''Of natural causes?''

''Officially, he died of a disease that he contracted while in Egypt with Napoleon. Unofficially, while I do not entirely approve of all the actions of my predecessors, they were usually effective.''

''I begin to see the drift of your argument. Pray continue.''

''Nothing more was heard of this business until 1863. Then, a British scientist, John Tyndall, picked up the thread. He studied the transmission of heat through the atmosphere, and through certain other gases.''

''Carbonic acid vapour!''

''Indeed, Watson. He found that this vapour, the dioxide of carbon, is a particularly effective heat trap. Fortunately, my predecessors were able to persuade him to take his studies in a slightly different direction from those of Baron Fourier, and there was no need for any drastic measures. If you search out the volume of the *Philosophical Magazine* for 1863, you will find that Tyndall is now immortalised for his suggestion that the great Ice Age was caused by a lowering of the amount of carbon dioxide in the air, allowing more heat to escape into space. Tyndall is still alive; I sincerely hope that no news of this affair, or of James's work, reaches his ears.''

''I see it now.'' Sherlock Holmes

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seemed satisfied. I, however, was still in the dark.

"Damned if I do, Holmes. You might let me in on the secret."

"It really is quite simple, Watson, now that all the facts are before us. If a reduction in the amount of carbon dioxide in the air makes the world colder, then increasing the amount must make it warmer, like the inside of a greenhouse."

"Of course. But so what?"

"How is carbon dioxide produced, Watson? From the combustion of carbon—"

"Well, yes, of course, but—"

"And what is the most common form of carbon?" He had crossed to the fireplace, and was holding up a black lump from the bucket beside it. "Coal! The very basis of our Empire!" Flinging the lump of coal down, and brushing his hands together in an ineffectual attempt to remove the grime, he began to pace the room.

"The British Empire is built on coal. Coal for our great industries, coal to power the ships of the Royal Navy and of the merchant fleet. And all the while, making the world heat up like a greenhouse. How long do we have, Mycroft?" He turned on his brother with the question.

"According to James, perhaps a hundred years before the problem becomes acute. By then, we expect human ingenuity to have found a solution to the problem. But if the discovery were publicised too widely, and dramatically, then the French . . . "

"Ah yes, the French. Let me see what is in your mind." Sherlock Holmes paused, head bowed, with a finger to his lips. "I believe I understand the workings of the political animal. Britain has a great Empire, an Empire founded on steam and coal. France, and other lesser nations, are jealous of this. No other nation has the resources of coal that Britain has, and no other nation uses as much coal as Britain does. If it were widely known that the burning of this coal may, in the long term, convert the world into a hothouse, with spreading deserts and crops failing in the fields, then no doubt the French might try to orchestrate a tide of international opposition to the activities of the British Empire, a league of nations seeking to impose restrictions and quotas on the amount of coal consumed. By offering such a seemingly reasonable case, to protect the globe from disastrous heating, they could restrict the use of coal, and cripple the British Empire at a stroke."

"Exactly so, Sherlock. The choice is clear. If we keep this matter quiet, then our Empire, and its science, can continue to grow. By the end of the twentieth century, surely that science will be able to solve the problem of this growing greenhouse effect. But if we fail to keep the matter quiet, then a clamouring of the nations of continental Europe may be able to use this imagined threat as a rallying call. At best, it would mean war, to maintain our way of life. At worst, imposing their will upon us in the name of fairness. Then, there would be no growth in our industrial and scientific prowess, and there would be no advanced twentieth century civilization to ensure the well being of mankind."

* * *

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And so, my story is complete. Faced with such a choice, what action could we take but to agree with Mycroft Holmes's demand for discretion? Felicity James has been left not only without a brother, but with her faith in the remarkable abilities of Sherlock Holmes completely (and quite unjustifiably) destroyed; her brother's reputation is left untainted by any hint of suicide, but without the gloss that his scientific achievements truly merit. To you, his heir of the late twentieth century, the carbonic acid problem may well have been solved many years ago, and this story out of your past will mean little. But to me, it means a great deal for my honor to have ensured that the genius of William Arrol James is known a hundred years from now.

The last page of the manuscript was signed, in a bold hand, "John H. Watson," and dated 17 January 1890. What would you have done with it? I could hardly send the typescript of a hundred-year-old paper off to *Nature* for publication in 1990. I'm not a scientist, and I don't know how to rework my ancestor's paper to make it presentable today. But Dr. Watson was an accomplished storyteller, and his accounts of the cases he worked on with Sherlock Holmes are still widely read today. As an eye-witness, he can certainly describe those events of November 1889 better than I could ever dream of doing. I needed a home for that description, in a magazine that regularly publishes popular, factual accounts of scientific work. I did have just a little trouble persuading the editors to take it on; they usually prefer descriptions of more recent discoveries. But in the end they agreed, provided that I wrote a few words to explain why the tale had not been told before. It's too late to make a difference to William Arrol James; but like Dr. Watson before me, I'm glad to have made the effort to ensure that his story is not forgotten, and that his true genius is at last acknowledged. ■

It is a matter of regret that many low, mean suspicions turn out to be well-founded.

Edgar Watson Howe

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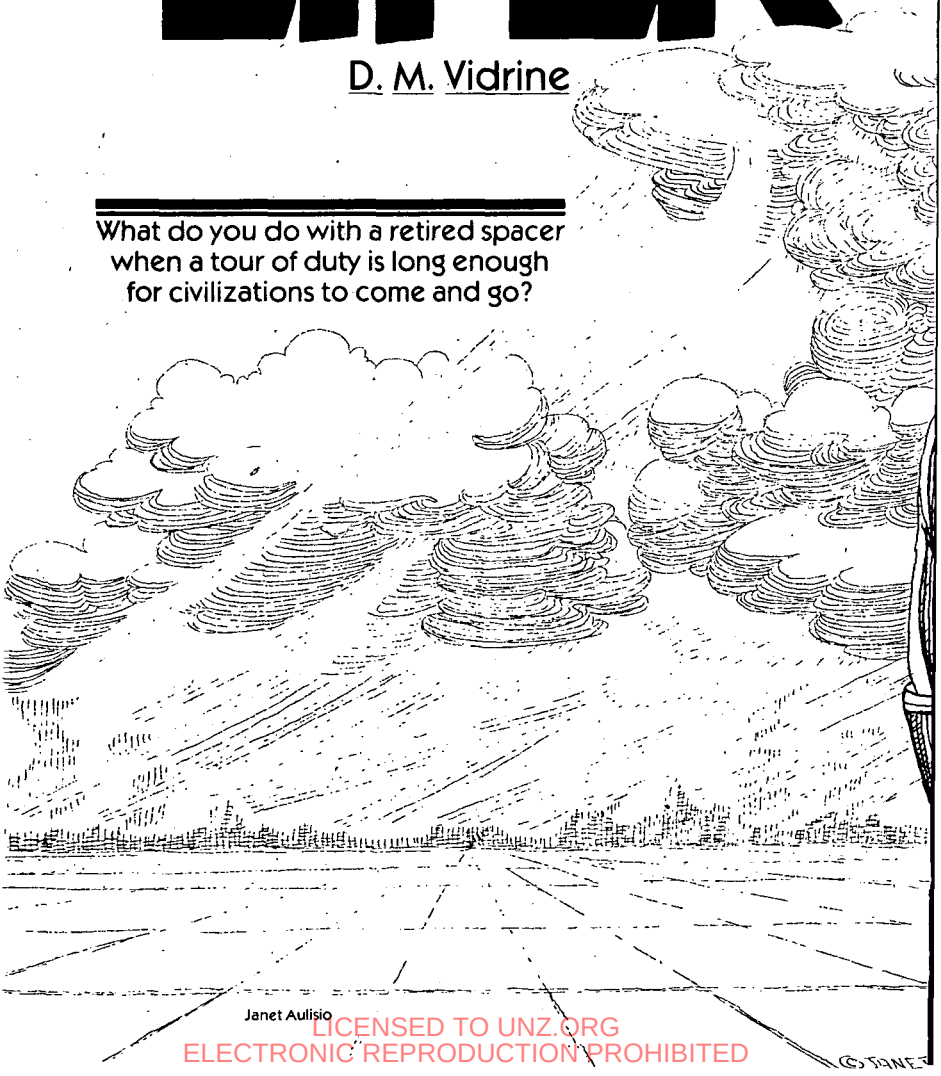
LIFER

D. M. Vidrine

What do you do with a retired spacer when a tour of duty is long enough for civilizations to come and go?



Janet Aulisio

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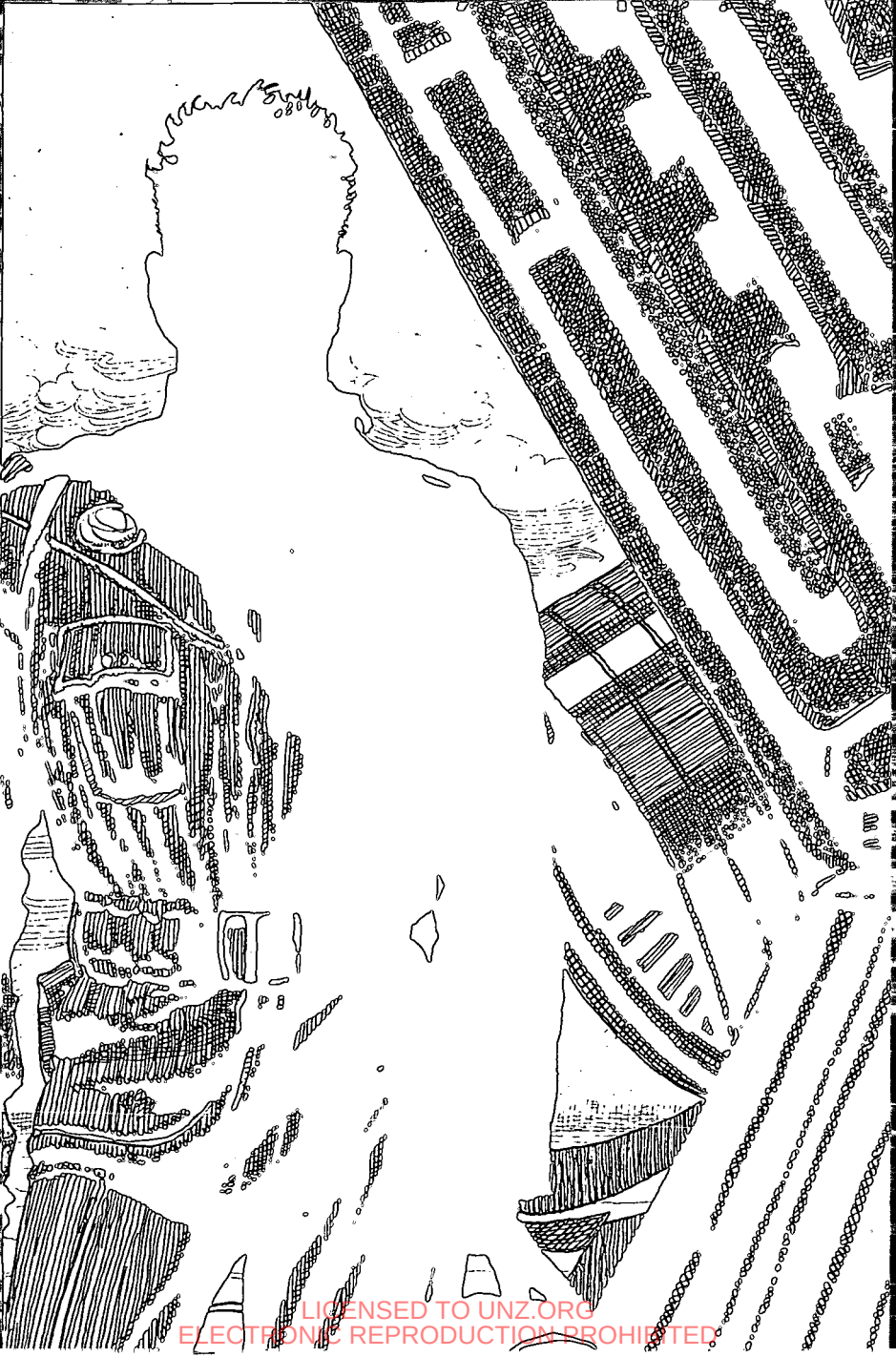

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"Chief Sadowski reporting as ordered, sir." Master Chief Reactor Technician Martin Sadowski held his lean, two meter frame at rigid attention and addressed his captain's back. There was an awkward silence between the men, shipmates and friends for three voyages. "You sent for me, Captain."

"At ease, Chief." Captain Nicholas stood, hands clasped behind in a relaxed parade rest, staring out at Earth rotating slowly below. "Your retirement orders came in."

"Yessir. I expected that." Sadowski paused. "It'll be hard—getting beached after so long."

Nicholas turned from the viewport. "It's never easy for a grounded 'lifer,' Chief, but regulations are clear. Retirement is mandatory after 'thirty subjective.' "

"Yessir." Again the uncomfortable silence.

"You're booked in at the rehab center." Nicholas said finally. "You're due there tomorrow afternoon."

"Yessir."

"I've made arrangements for your retirement ceremony. We'll pipe you over the side immediately after we've grounded."

"If it's all the same to you, sir, I'd rather leave quietly—no ceremony."

"As you wish, Chief. I think I understand." Captain Nicholas strode to his terminal and spoke, "Enter personal validation on Chief Sadowski's retirement orders." He thumbed the identiplate.

A crisp, pseudo-female voice intoned, "CAPTAIN ARTHUR L. NICHOLAS IDENTIFIED—RECORD VALIDATED."

"Transmit to Central and dump Sadowski's record." Nicholas instructed the machine.

"TRANSMITTED. RECORD COPY MADE.

The terminal beeped and ejected the small plastoid chip carrier which now contained Sadowski's completed service record. Nicholas held it out to his friend and forced a smile. "I wish you luck, Marty."

"Thank you, sir." Sadowski took the proffered record and left. As the door slid closed, he saw that Nicholas had returned to his contemplation of the planet.

The ship grounded at the refit dock late the next morning. Sadowski took his time packing his duffle, pausing briefly—remembering—as he placed each article carefully into the small bag. A spacer couldn't own much, so it didn't take long. His black uniform was neatly pressed, the decorations a bright patch of mixed color above the left breast. His boots, gleaming like new, rang hollowly as he strode down the metal companionway for the last time. There was only the junior officer of the Deck to mark his departure. Most of the crew had long since forsaken the ship for one of the "period towns" which ringed the landing field, and catered to star crews on refit layovers.

Because of the time dilation effect, any starship crewman who made more than one voyage inevitably returned to an Earth substantially different from the one in which he had grown up. This

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dislocation in time caused many to feel severely cut off, so the service had evolved the period towns, each representing roughly a quarter-century time span. Great care was taken to ensure that they maintained certain touchstones of permanence against a familiar background of language and costuming. Most also managed a fairly faithful replication of the contemporaneous food, lodging, and entertainments, along with the obligatory ginmills and brothels. For the spacers, the towns were islands of familiarity on which they lived until the next voyage.

Sadowski made his way to the tube station and studied the schedule of trains to the Houston megalop. Two hours to kill! On impulse, he crammed his duffle in a locker and caught a local air sled for 21-IV. He'd have one last beer at Rosie's.

Sweet Rosie's Tavern and its jovial proprietor were fixtures of 21-IV. The bar always had the same half run-down look, even to the peeling paint on the sign that promised "Beer and Billiards." Sadowski went inside and stood for a moment allowing his eyes to adapt to the darkness.

"Sadowski!" Rosie shouted. "Welcome home—first beer's on the house!" She turned to the bartender, "A cool one for my friend."

Rosie looked the same as always and sat at her usual place, a high stool behind the bar where she could survey her empire. She might once have been pretty, but Sadowski had only known her as plump and middle aged. The bartender was a young man whom Sadowski did not recognize. It seemed like Rosie always changed the hired help while he was away.

"Thanks, Rosie." Sadowski mounted a stool. "Only got time for one—just came to say good-bye."

"Good-bye?"

"I'm being put ashore, Rosie—retiring. Gotta go to Houston this afternoon for rehab."

They talked about his retirement while Sadowski nursed his beer, and Rosie clucked sympathetically. Too quickly, the beer was gone and it was time to go. Rosie wished him well, and he felt better as he headed back to the local station. It helped to know some things never changed.

Back at the tube station, Sadowski retrieved his duffle and boarded the express for the rehabituation center in the Houston megalopolis. He sat alone, his uniform and demeanor clearly not inviting conversation. As they pulled out of the lighted platform area into the tube's darkness, the window faintly reflected his own image. Sadowski studied it critically, as though it were the face of a stranger. Close-cropped brown hair was turning rapidly grey. Craggy features and a hawk nose accentuated deep-set brown eyes. Sadowski's thoughts drifted—to a place high above the desert under which he sped toward his unknown future—out into the blackness of space and its timeless voids. He was not conscious of the passage of time until the train slowed for the Houston station. A glance at the platform chronometer showed that it had not been a long trip. From the tube station, it was a brisk five minute walk to the rehab center.

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* * *

Somehow the center managed to look like all government institutions, despite its soaring glass-and-concrete facade and plushy carpeted lobby. Filmed windows and air conditioning kept the midsummer Texas heat and humidity at bay. Inside, Sadowski found a receptionist ensconced behind a glassy black, kidney-shaped desk with a small screen molded into its surface. Her perfect blond hair cascaded to her perfect, bare shoulders, and her perfect smile revealed perfect white teeth. "Yes, sir?" She asked as Sadowski approached.

"Master Chief Reactor Technician Sadowski—I'm here for rehab." Sadowski had just managed to stop himself from saying, "reporting as ordered."

"Oh, yes, Mr. Sadowski. Just one moment."

"*Not Chief Sadowski anymore,*" he thought to himself, "*just plain mister.*" It made Sadowski feel dull, mundane —anonymous.

Miss Perfect glanced at her console and spoke a few quiet words. In a moment, an almost identically perfect, though brunette, young woman appeared and introduced herself. "My name is Paula. I'll introduce you to your quarters, Mr. Sadowski, then you can refresh and get changed before the orientation session. Do you need help with your luggage?"

"No." Sadowski hefted his duffle with one hand.

She turned, then, and led Sadowski out of the lobby and along a wide, well-lighted corridor. The translucent body suit she wore was seamless and did almost nothing to conceal what it covered. Sadowski easily caught up to walk abreast of her, and carefully avoided staring. They walked for only a few minutes.

"Here we are." She looked up and smiled broadly, which showed *her* perfect teeth, and transfixed Sadowski with emerald eyes. "These are your rooms." The softly glowing numerals on the door read 1-27. Paula palmed the identiplate on the doorframe.

A smooth male voice announced, "Guide Paula identified. Please state your request."

"Introducing Mr. Martin Sadowski for access to suite number 1-27." Paula stepped aside.

"Martin Sadowski, place your right palm on the identiplate and state your name." When Sadowski had done as requested, the same suave voice announced, "Scanned and voice print made. You may enter." The door hissed open.

Paula smiled again and said, "Two suits of clothing and a complete set of toilet articles have been provided. You'll have a chance to purchase more later. Please make yourself at home." She left Sadowski to examine his new surroundings.

The rooms were palatial by starship standards. Sadowski first entered a large, indirectly lit chamber which was a combination sitting and entertainment room. One wall was filled by a console housing holo-projector, disk player, comm console and speakers for the sound system. A small refrigerator contained several kinds of beverages, but nothing Sadowski recognized, or wanted. Against the opposite wall were arranged a large, comfortable-looking couch and two matching chairs. In the adjoining room

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he found a bed which looked big enough for four and was firm without being stiff. A well padded chair occupied one corner with a table and reading lamp adjacent. The bathroom was more spacious than his entire compartment on the ship. In two minutes he had explored everything—and hated it. He kicked off his boots to lie on the bed.

Sadowski was awakened by the comm system chime in the next room. He spoke from his position on the bed, "Answer!" The call transferred to a speaker set into the wall above his head.

"Mr. Sadowski?" The voice was familiar. "There's no video."

"I'm in the bedroom, Miss—"

"Oh. It's Paula. The orientation meeting is due to start in twenty minutes in the central presentation hall, I'll come by to show you the way."

"Very well. I'll be ready." Sadowski rolled off the bed and padded into the bathroom to splash water in his face. Somewhat refreshed, he inspected the two outfits which hung in his closet. He was forced to admit that someone had done their homework. The sizes were all correct, although the styles and colors were a bit daring for his tastes. He selected the more conservative of the two, white stretch pants and an electric blue tunic. The boots were black and luxuriously soft.

Sadowski removed his uniform and folded it carefully into his duffle. He stowed the duffle and his boots at the rear of the closet then dressed in the unfamiliar civilian garments. He was just buttoning the tunic when the door announced a caller. "Open!" He said loudly, and the door hissed aside to admit Paula, dressed as before. Without really wanting to, Sadowski noted that she appeared to be completely depilated. He shifted his attention to her face and managed a gruff, "Shall we go, then?"

If Paula noticed his discomfort, she said nothing. The door slid aside, then automatically locked behind them. They walked side by side, hips occasionally brushing as they made the short trek to the auditorium at the center of the building. Only a few others were present in the auditorium. Each retiring spacer was accompanied by a guide of the opposite sex who exhibited an uncommon degree of physical perfection. Sadowski wondered how they were selected, and if their perfection were imposed by plastic surgery. After a few minutes, the lights dimmed and the solid image of a handsome, middle-aged man appeared at the center of the small stage.

The image spoke, "Welcome to the Central Texas Rehabituation Center. I am Jacob Flannery, center director." The image paused and scanned the auditorium.

Paula leaned over and whispered, "This was recorded at an earlier session. It's used when Flannery can't be here."

The image continued, "Our job here is to ease your transition into current society, and to bring you up to date on all of the social and cultural changes which have occurred during your period of absence. Some of you will have an easier time than others, depending on your individual makeup, and the length of time you have spent in time-dilated flight. Each of you has been assigned a guide to ease the transition. That per-

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son will act as companion and mentor throughout your stay." Sadowski glanced over at Paula, but she seemed focused totally on Flannery's image. He returned his own attention to the presentation.

The introduction to the center and its rehabituation process took about forty-five minutes. Basically, it was a graduated program of auto-instruction, short stays in the period towns ('moving uptime in stages'), and increasing exposure to current society.

On the walk back to Sadowski's rooms, Paula suggested that they have dinner brought in and spend the evening mapping out his transition. She explained that the six-week rehabituation could be paced somewhat to his comfort level, but his degree of success in reintegrating depended on his own efforts.

Sadowski scowled. He didn't like being dirtside, and he for damn sure didn't like the idea of being *reintegrated* to anything. "*Dammit!*" He thought. "*I'm a spacer, not a grounder.*" Even Paula's determined cheerfulness did little to lighten his mood.

Dinner was excellent, delivered and efficiently set up by unobtrusive roboserve units. Afterward, the roboserves reappeared unbidden and whisked away the residue.

Quiet descended; the only sound in the rooms was the gentle sighing of the air conditioning. Paula removed her boots and sat on the couch, curling her legs beneath her. The slick material of her body suit made whispery, slithering noises as she settled herself. Sadowski stood awkwardly, undecided whether to sit next to Paula, or take the chair. She patted the cushion next to her and said, "Come sit here—Martin."

"Marty. Nobody has called me Martin since I left home at nineteen." He sat.

Paula was good at her job. Without Sadowski realizing it, she slipped inside his defenses, and they talked into the late evening, planning a program for the coming weeks. They also talked about themselves. Sadowski recalled his boyhood in Colorado, and Paula told how she'd grown up in Houston's middle-class warrens as the older of two girls. The hours passed quickly.

When it was time for Paula to leave, she surprised Sadowski with a quick embrace and light kiss on the cheek. His body tingled for a long time after she left. None of the "sack buddies" he'd found among the distaff crew had ever caused any such sensation. "*Maybe,*" he thought grudgingly, "*the return to earthbound life won't be too bad after all.*"

Early the following morning, they started with the auto-instruction sessions for the early twenty-second century period, and for the corresponding period town 22-I. There were six periods to cover, and not much time.

The next three weeks were a torturous mixture of sessions at the center and stays in the period towns. Sadowski felt constantly out of phase, always a step behind in the frenetic race to complete his trip uptime by the end of the allotted six weeks. New information crowded in on him, and the constantly changing surroundings became a kaleidoscopic blur. He actually began to look forward to the brief respites afforded by returns

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to the center after each period town stay. His suite at the center began to represent the only island of stability in a confusing whirl of ideas, mores, and strangers.

Paula was unperturbed and flawless. Her costuming, mannerisms and speech always remained in character for the period. Whenever Sadowski fumbled, or was unsure, she quietly guided him through, whispering instructions and showing him how. She seemed to really enjoy the music and holoflicks, and the changes in food preferences which left Sadowski questioning anew the wisdom of the whole reintegration program.

It was at the end of the third week, during an evening of relaxation after their stay at 22-III, that they became lovers.

Dinner had been a feast of crab salad, hot rolls, and an excellent vintage from California. They ordered a second bottle and settled onto the couch to view a current holoflick. After only a few minutes, Sadowski noticed that Paula was watching him, not the projected action, and that her breathing was heavy and a little ragged. He commanded the projector off and leaned toward her. Suddenly they were together—a tangle of limbs, hands, lips, and soft murmurings.

Sadowski fumbled at Paula's body suit, vainly searching for a clasp or fastener. Finally she pulled back laughing and stood. In seconds she had peeled the garment down from her shoulders and stepped out of it to stand before him, smiling at his sharp intake of breath. Sadowski's earlier speculations were proved correct, there was no hint of hair. He devoured her loveliness —feasting on a perfection he would not have believed possible.

Paula took his hand and quietly led him into the bedroom.

When Sadowski awoke next morning, he lay quietly for a long moment gazing at Paula. She looked peaceful in sleep, her dark hair an inviting tangle against the pillow. He kissed her awake. She stretched, arms extended above her head and back arched, then reached for him.

Later, showered and breakfasted, Sadowski was seized with a sudden enthusiasm. "Paula, I want to go to Colorado. I want to see the lakes and the mountains again."

"All right, Marty, I'll make arrangements for a flyer and we'll go this morning.

The flyer was a sleek oval, fattened along its long axis to accommodate seating for four. The lift fans were built into the flaring sides, which gleamed in the mid-morning sun. A large number 21 was emblazoned in red on the vertical stabilizer. Paula was already seated at the controls as Sadowski walked onto the pad. He climbed aboard and the canopy whined closed.

"Buckle in and we're off!" Paula grinned at him then turned to her piloting chores. She spoke into a tiny microphone mounted on a transparent tube extending from an earpiece in her left ear. "Houston Departure, Rehab 21 activating autocontrol plan for Denver."

Sadowski couldn't hear the reply, but Paula relaxed and leaned back. The flyer lifted gently and ascended slowly to a

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height of about 100 meters, then turned to aim northwest and accelerated sharply.

"That was some departure," Sadowski commented as the flyer rushed upward. The air was clear, but here and there towering stacks of cumulus were beginning to form. Paula explained that the flyer was under control of the air traffic management computers and would remain so until they arrived in the Denver area. In two minutes they leveled at 15,000 meters and the red numerals on the mach indicator rose quickly, then held at 0.91.

"We'll be there in about an hour," Paula said. "Meanwhile, let's enjoy the ride." She began pointing out landmarks as they sped along. After several minutes of sight-seeing Paula asked casually, "Marty, have you thought about what you're going to do after rehab?"

Sadowski opened his mouth to reply, then stopped. He hadn't even considered it! Sheepishly, he shook his head and said, "No—I haven't given it any thought at all." As the miles slipped behind the speeding craft, they discussed his options. With his savings and pension, he could live adequately in the present, but without frills. Several abbreviated technical retraining programs were available if he chose to work in a commercial power plant to capitalize on his reactor experience. As a third alternative, he could go back to school and learn new skills. None of the options seemed very appealing to Sadowski, but he'd have to decide on something if he and Paula . . .

Paula straightened in her seat and placed her hands on the flyer's controls, "Roger, Denver, Rehab 21 local visual, surface to 3,000—descending now." The flyer slowed and plunged toward the frontage range. As she flew along above the heaped-up jumble of peaks and sharp canyons, Paula commented that the Denver megalopolis now extended from Boulder in the North to Colorado Springs in the South. There was very little open land left in the flat areas below the mountains.

"Is it all like this?" Sadowski's voice was almost plaintive.

"Except for the reserved wilderness." Paula glanced at him then returned her attention to flying. "About fifty years ago, the government finally acted to preserve the remaining wilderness areas. All the residents were relocated to the cities and the areas were closed. Now only researchers and government conservationists are allowed into the preserves."

Sadowski thought for a few moments about what Paula had told him then said, "Let's go back." He slumped in his seat, all interest in the scenery gone. Paula flew in silence and did not disturb his brooding.

When they had landed and a technician took over responsibility for the flyer, Sadowski and Paula reentered the center. Finally Paula broke her silence, "There's something I want to show you, Marty. You're not scheduled for this until week five, but I think it's needed now." She led the way to a lower level of the center—one Sadowski hadn't seen. They came to a set of double doors marked "Recreational Simulations," and entered. Paula approached the only occupant of a small, plain lobby—a

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mature woman dressed in a blue coverall, seated at a gray metal console.

"We'd like a linked sim—Sadowski—rehab." Paula's tone was uncharacteristically businesslike, short and clipped. The clerk touched the display screen then handed Paula a card which emerged from the console.

"Room 25—back there." The woman gestured over her right shoulder with her chin and turned back to her console, dismissing Paula.

Together, Paula and Sadowski walked down a short, narrow hallway lined with doors. Room 25 was on the right, halfway down. Paula inserted the card into a slot in the doorjamb and the door slid aside.

They entered a small room with heavily draped walls and two semi-reclined chairs set side by side. "These chairs are equipped with direct neural stimulators." Paula explained before Sadowski could even frame a question. "You wear this headband," she held up a black padded band about five centimeters wide, "and the sim computer makes a two-way link. It reads your brain wave patterns to pick up your commands and actions, and directly stimulates your sensory centers to produce full spectrum feedback. Virtually any scenario you imagine can be run for you—or you and one companion."

"Why have you brought me here?" Sadowski was a little confused by the rush of technical information.

"For our walk in the mountains—to smell the clean air and hear the birds. . . . " She trailed off when she saw Sadowski's frown deepen to a thunderous scowl.

"But it won't be real! It's just a blasted simulation—an illusion!"

Paula attempted a smile. "But if the illusion is good enough, what does it matter?"

"What happens when the illusion becomes more important than reality? When you can't tell one from the other anymore?"

Paula didn't answer, just stared thoughtfully at Sadowski for a long moment. Finally she asked, "Do you want to leave?"

"Yes." His one word carried a lifetime of regret and resignation.

The clerk raised an enquiring eyebrow as Paula silently handed her the keycard, then sniffed offendedly as they walked out.

"What's her problem?" Sadowski asked.

"Prejudice." Paula answered shortly.

"Against spacers?" Somehow that didn't make sense, but Paula didn't respond so he dropped the subject. They continued their walk back to his suite in silence.

After dinner they made love again, then took a long shower together. Lounging on the bed later, Sadowski began talking about retraining and beginning to work again. He rambled on, relaxed and drowsy, about finding a place to stay—something large enough for both of them. . . .

Paula suddenly sat upright. "No, Marty! That's impossible."

"What's impossible?" He was instantly awake—jolted by the distress in Paula's voice.

"Us—together. It just cannot be." She turned her face away.

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"Why not? I know that you care for me—that you love me. And I love you—I want to make a life with you." He felt great relief now that he had finally let his feelings out—he hadn't even admitted them to himself until just that moment.

Paula's visage was contorted as though in pain as she turned back to face him, "My assigned function is here—I can't leave."

"You can find a new job—you're good at so many things. . . . "

Paula held up a hand to silence him, then took his left hand in both of hers. She spoke so softly he almost didn't hear the words, "Marty—I'm a bio-droid, a biological android. The government had me designed and produced to service the rehabituation process—I *belong* to the government!"

"You can't be an android! You're too warm, too real! Your emotions are real—I can feel it!" Sadowski's voice rose until he was almost shouting—trying to deny what the logical part of his mind already knew had to be true. It answered too many questions he had not allowed himself to ask.

Paula shook her head sadly. "It's true, Marty. Each of the guides on the staff is a bio-droid—all highly advanced—more biological system than machine."

"Do you *feel* anything?" Sadowski withdrew his hand. "Are you programmed to seduce all your—clients?"

Paula ignored the second question. "We are able to simulate very closely all human functions, and even emotions. Our sense of touch is extremely fine—vision is multi-spectral and very acute. I can hear your heart beat across the room." She paused, and appeared to be struggling internally with some momentous problem. "Emotional response patterns are a deeply ingrained part of our makeup—all of the appropriate physiological responses are there." She paused for a long moment. "Is *that* feeling? I don't know, Marty—I just don't know." Her voice was low and sounded extremely weary.

"And your middle-class family?" Sadowski's voice was flat now, emotionless.

"It's not real—just a planted memory. It's so well done that even I sometimes forget it's a fabrication."

Numbed by the revelations, Sadowski was having great difficulty accepting the idea that the woman he had fallen in love with was a machine. He looked up at Paula and said, "Then the clerk at the simulation center . . . "

" . . . is human, and doesn't like androids." Paula finished. She got up from the bed and began to dress. "I'll leave you alone for a while." He made no reply, so she finished dressing and left quietly.

Sadowski sat in silence for a long time, sorting through the bits and pieces as afternoon turned slowly to evening, and then into night. He could see how an attractive, admiring companion could make a spacer *want* to change enough to reenter society. But what happened when that same spacer fell in love with his robot guide? Eventually he got up and went to the closet. His duffle was still there, back in the corner. He got it out and dressed. It was 2107 when he walked out of the center and hailed a cruising autocab and directed it to 21-IV. He couldn't really afford the fare,

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but somehow it didn't seem to matter at the moment. He leaned his head back on the seat and reflexively rested one arm on his duffle.

Rosie was in her usual place, still unchanged. She greeted Sadowski with surprise, then nodded toward the back corner when he asked for Nicholas. He ordered two beers. While he waited, Sadowski looked at Rosie, so that he *saw* her for the first time, and reflected that it didn't do to examine illusions too closely—it tended to spoil the effect.

Sadowski dropped his duffle to the floor and placed a beer in front of Nicholas. He sat without invitation and hunched over his already half-empty mug, cradling it in bony hands.

"Marty! It's good to see you—but why are you in uniform?"

"Looking for a berth. You still need a reactorman?"

"Yes, but you know I can't sign you on. Marty, you're retired now, there's nothing I can do. Even your wearing that uniform is not permitted unless you're at an official function." Nicholas took a long pull at his beer, but it was bitter and flat, and did nothing to clear the taste his words had left.

"There are other captains—I'll find somebody to take me on."

"I'm the only one left in 21-IV, Marty—and no captain can take you on. To do so would mean immediate loss of command."

"The commercial spacers—"

"Are bound by the same regulations. The government says you're too old to go out again—and they are serious about enforcement."

"So I've gotta stay dirtside?"

"Marty, it's not up to me. . . . "

Sadowski swallowed the remainder of his beer then rose abruptly and walked into the cool, high-desert night. He stood on the sidewalk and looked around at the once-familiar town with its noisy, pushing crowds. The lights seemed gaudy somehow, and he noticed for the first time that the people dressed and talked strangely. With a profound sadness, Sadowski realized that he no longer fit in his own time. He turned and wandered aimlessly through the streets of 21-IV until the reborn sun turned the eastern sky to gold.

As full daylight brought the inevitable heat, Sadowski found himself back at the tube station, where a small part of his consciousness reported the fact that he no longer had his duffle. For all Sadowski knew, or cared, it was still at Sweet Rosie's. He bought a set of cheap civies and left his uniform hanging in the fitting room of the all-night shop. The tubetrain ticket back to the rehab center didn't cost nearly what the cab ride of the previous evening had.

Paula was waiting in his suite when Sadowski returned, sitting on the couch with her legs tucked up. "You've been to 21-IV." It was neither question nor accusation, simply a statement.

"Went to talk to an old friend."

"Nicholas?"

"He can't take me back. Nobody can—I'm beached. I'm too old to go out again. Don't fit in the service anymore—don't fit at 21-IV." He slumped wearily in the chair and kicked off the cheap boots which had begun to pinch his feet. "Where *do* I fit, Paula? What

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does the service do with old, used-up spacemen?"

"You're the only one who can decide what becomes of you, Marty. You either choose to adapt, or live as a misfit."

"And what of Paula? Where does Paula go?"

"On to the next assignment, until I've outlived my usefulness and they retire me."

Surprised, Sadowski said, "Don't they just reprogram you, give you the knowledge you need and the pre-programmed reactions to simulate?" There was more than a hint of bitterness in his tone. "That's how you were able to keep all the period stuff straight, isn't it?"

"Yes. But knowledge and clever programming isn't all of it. Bio-robotics is still new and advancing very rapidly. In a decade or so, I'll be completely obsolete, and they'll replace me."

"Will you be dismantled?" Sadowski felt an unwilling concern.

"No. I'll probably be assigned to one of the period towns as part of the local background. I'll sell tickets for the theatres, or clerk in a curio shop, or any one of dozens of invisible jobs. I can't be a fixture character—the ones you see on each stay. My biological system is only good for about thirty or forty years."

"You—age?"

"Eventually. All bio-droids do. It's part of the cost of the close simulation of human life."

"Then you are alive."

"In a very real sense, yes. But not human. I can't reproduce. My metabolism is a chemical processor that converts the food I eat into nutrients for my biological system, and my intelligence is electronic."

"Do you have emotions?"

"There's no way I can answer that, Marty. I can tell you that bio-droid designers are very attentive to detail. My central processor stimulates release of the appropriate hormones and glandular secretions, so the physiological responses are all correct. In a human there would be no question. In a bio-droid . . . "

"Oh." Sadowski was silent for some minutes, head lowered. Finally he rose wearily and said, "I need some sleep. Let's have dinner together later."

Over dinner, Sadowski told Paula his plans. "I've decided to sign on at the refit yards. If I can't fly in starships, at least I can work on them, and talk to spacers."

"Where will you live?"

"In one of the period towns. I want to spend the remaining weeks of rehab deciding where I fit best, then settle there. 21-IV seems strange to me now."

"You couldn't settle there anyway. It's due to be replaced by 23-III as soon as Nicholas lifts. His crew contains the last of the 21's. They'll all be retired next time down.

"Oh." There was silence for a while as each of them dealt with private thoughts.

Eventually Paula broke the silence. "Many retiring spacers decide to settle in a period. It helps the background."

"Why don't you tell us that at the beginning?"

"Because it's really up to the individual. If that's the right solution, it usually works out."

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* * *

The final three weeks of rehab were bittersweet. They were close again, but not like before, not lovers. Sadowski applied to the service's shipyard as a reactor fitter and was accepted. Paula helped him locate an apartment in 22-III, and he found that he was actually looking forward to his new life. It would be good to get his hands on a reactor panel again.

Inevitably, the final day came and it was time to leave. Paula walked with Sadowski from his suite to the lobby where they'd first met. They stood close together, not touching, and there seemed to be nothing left to say. A small tear spilled from the corner of Paula's left eye and trickled down her cheek to hang trembling on the precipice of her jawline. It caught the late afternoon sun and glistened for a moment, then fell to the carpet and was lost.

"Good-bye, Marty." Her voice was a low, tight whisper.

"Good-bye, Paula. When they eventually decide you're obsolete, you know where I'll be." He turned and walked from the center without looking back, then boarded a tubetrain for 22-III. ■

(continued from page 81)

order, I express gratitude to Fuzzy Pink and Larry Niven, the astronauts and cosmonauts and everyone who worked their butts off behind *their* mighty silhouettes to make the space efforts of Mankind the success they have been so far, to Jerry & Kathy Oltion, Vincent Di Fate, Robert McCall, Isaac Asimov, Janet-some-day-I-want-to-see-your-originals-Aulisio, Jack Gaughan, Rick Sternbach, Dell Harris, John Schoenherr, Gordon R. Dickson, Jeanne and Spider Robinson, Roger Zelazny, Peter Fergusson, Frederik Pohl, John Berryman, Poul and Karen Anderson, co-Aerospace-Giant-Employee Grant Callin, and all of the delightful authors I have been given the privilege to illustrate for . . . including the *difficult* ones like Harry Turtledove and Dr. Charles Sheffield. (It's tough to keep up with experts when you're a layman!)

The people who need special thanks for making this work possible are Street & Smith Publications and Condé Nast, whose issues are parodied here with loving care; John & Sherry Sanfilippo and the members of P.N.T.T.A. for reference and research; Dr. John Cramer & family for support and faith; Stan Schmidt for his kind words and infuriating, irrefutable logic; John W. Campbell, whom we all thank for six decades of immunization to future shock; and Elizabeth (the Dragon Lady) for making my life a living heaven.

Am I leaving anyone else out? No, I guess—wait. How could I? This piece is dedicated to my teacher & mentor, Polly-Frank-Laura-Brodian-Kelly-Freas, with deepest affection and admiration. It's too much to ask . . . but may I be as giving some day.

It's called "Foreign Language Edition." And I *like* the idea that when we *do* make contact with extraterrestrial intelligences, that our intelligent fiction will become the bestsellers available in spaceport newsstands everywhere.

And I do mean "everywhere."

—William R. Warren, Jr.

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ECHOES OF AN ASTOUNDING PAST

It's not *Analog*'s custom to reprint old material; we pride ourselves on bringing you a whole magazine of high-quality *new* material every four weeks. But we're not rigidly bound by custom, either, and a Sixtieth Anniversary is special enough to warrant an exception or two to usual practice. With the magazine so much older than many of its readers, many of you have only known it personally through a small part of its history. We thought you might appreciate the chance to recapture some of the "flavor" of its earlier years. So we've devoted a small portion of this Special Anniversary Issue to a section that will let you do just that.

Of course, no section such as this could hope to offer a true representation of those sixty years—which, after all, saw the publication of many thousands of stories and hundreds of articles, editorials, and special features. But we've tried to choose a sampling that would capture in a small space some of the essence of what *Astounding/Analog* has been about: the creation of worlds, the exploration of ideas, the stretching of minds.

Isaac Asimov's "Nightfall," an early product of both his career and John W. Campbell's "Golden Age," is nonetheless considered by many to be one of the most memorable stories ever written. Fredric Brown had a special talent for short short stories, and it's hardly surprising that he wrote "Letter to a Phoenix" a few years after World War II. In that period Poul Anderson was just beginning to build his reputation as a master worldbuilder and storyteller, through a rather astounding number and variety of tales including the series to which his 1970 "Birthright" belongs.

While stories have always been this magazine's reason for being, artists have often added a great deal to what authors crafted in words, and the stories included here are reprinted with their original artwork. The overall direction of the magazine has very much reflected the visions of its editors, who have also directly addressed their readers, hoping to stimulate and/or infuriate, through their editorials. This section would hardly be complete without a couple of those: one by John W. Campbell, one by Ben Bova.

We hope you enjoy them all: words, pictures—and, above all, ideas and imagination.

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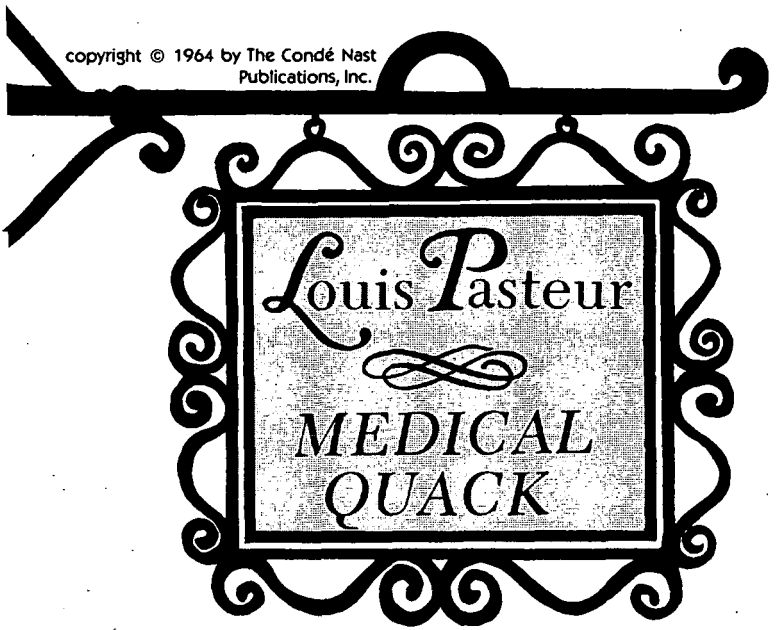

EDITORIAL BY JOHN W. CAMPBELL

"Be not the first by whom the new is tried,

"Nor yet the last to cast the old aside."

Polonius' advice to
Laertes, from "Hamlet."

My recent editorial on "Fully Identified," concerning the FDA's press splash that Krebiozen had been "fully identified" as creatine brought in a lot of letters, and a lot of phone calls from people acutely interested in Krebiozen.

My point in the editorial had been single, simple, and specific: whether Krebiozen was or was not useful in

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treatment of cancer I did not know—but that the FDA's press release was exceedingly bad science, anyone who took the trouble to study the matter a little could readily see. It was a great piece of publicity work—all about the summer student who tracked down the spectrogram . . . charts and what-not—got a big splash in *Life* and the newspapers. As publicity stuff, that was a Grade A piece of work. Having some familiarity with the art myself, I recognize a real artist's touch.

That doesn't make it science. I've learned since that it not only wasn't science, it wasn't even honest reporting. The sample of Krebiozen the FDA reported on, according to data published in the "Congressional Record," was light tan in color, and fluorescent under ultraviolet light. Creatine is snow-white, and not fluorescent. The fact that any sophomore chemist would immediately recognize that an impurity was present seems not to have reached the scientists of the FDA's staff.

My objection was simply and solely to the specifically nonscientific methods being used in the name of Science in that instance. The letters I got—and the telephone calls—were from individuals who had a very different problem.

One typical one was from an electronic engineer in his late thirties. Four years ago he was operated on for cancer of the intestines; a year ago the cancer recurred. The doctors who examined the situation then told him that it had spread, and was inoperable; they could offer him only palliative medication that would prolong his life, and reduce the pain.

Six months ago, he started taking Krebiozen. The pain left, and the tumor shrank away.

The FDA has now announced that they have "determined" on the basis of "scientific evidence" that Krebiozen is ineffective because it is "nothing but creatine," and, therefore, have ruled that he cannot have Krebiozen any more; it will be illegal to sell it.

So what's his situation? In effect, the FDA is telling him to go back on a "morphine diet," and toddle off to the grave like a good little man, and stop messing around with these unorthodox treatments that aren't good for him.

I would like to raise a question here: Is it ethical for a group of men who can offer him no hope whatever, to deny him the right to *try* a remedy of which they do not approve?

For that matter, is it ethical to take from a man who is recovering a remedy which *he believes* is curing him?

Any doctor knows that there is such a thing as a "placebo effect"; that a completely inert material, which the patient believes in, can produce an effect when a biologically potent material, which the patient distrusts, will not.

One example of that: an arthritis patient, when cortisone first began to become available, had been begging her doctor to let her have some. The doctor told her it was hard to get, but that he had a new remedy that was supposed to be almost as effective, and he would start trying to get cortisone for her as soon as he could. In the meantime . . .

He did, in fact, have cortisone on hand. He did, in fact, give her cortisone injections. For four weeks, she was getting cortisone, while the doctor told her

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he was trying to get some for her. She showed no improvement or reaction to the "substitute"—which was in fact cortisone. The fifth week, with great showmanship, the doctor told her the cortisone had finally come in, showed her the cortisone ampule with its label, filled a hypodermic with sterile saline solution, and injected that.

She showed immediate and dramatic improvement on the sterile saltwater therapy.

That phenomenon is one of the things that makes evaluating therapeutic techniques somewhat more difficult than measuring a voltage, or weighing electrons or the companion star of Sirius.

The field of medicine is one area where subjective reality and objective reality directly interact; they cannot be separated. The term "psychosomatic" has been sort of dropped, and a new term not including the offensive "psycho" term substituted; they are now called "stress-associated diseases," or "stress-associated" conditions.

Every indication is that cancer is a stress-associated disease.

With the above data in mind—is it ethical for any group of men to deny Krebiozen to an individual in the spot my telephone caller was in?

The problem in this whole area of medical therapy is acutely emotional; that is why such exceedingly bad "science" as the FDA's Krebiozen report keeps showing up. It's long been known that human beings tend to count their successes carefully, and forget their misses—and to forget the other guy's successes, and count all his misses. The more intensely emotional the situation, the more powerfully that tendency is manifested.

And medicine is the field where emotional forces are on a full par with objective forces. The problem is that that applies not only to the patient—*but to the doctor as well.*

Let me put it this way: Consider two ideals of what a doctor should be.

1. The patient wants a doctor whom he can trust not only as a wise and learned man, but as a friend in his time of trouble, a man with genuine sympathy and empathy—a man who is personally and genuinely concerned for his patient's welfare. Simply—a doctor should be a man who *cares* what happens to his patients.

2. The theoretical ideal of a doctor is a man who is highly trained, skilled, and intelligent, a man who thinks coolly and objectively at all times, in all emergencies, who does not get flustered, and whose judgment is not warped by emotional factors.

Look those two ideals over carefully—and you'll see at once that they are mutually exclusive. If a man cares—then he is influenced by emotional factors. If he is cool and objective—then he is not warmly sympathetic. Moreover, he'll make a poor doctor—because the emotional factor is a critical factor in the therapy of the patient, and the "cool, objective thinker" specifically withholds emotional warmth.

Now anyone—in or out of the medical profession—will agree that there are always some cynical men who become doctors as a way of making a high income, and getting high social status. And that such men do not deserve the title "doctor."

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And if you think about it carefully, you'll recognize that the cynical, money-hungry, status-seeking M.D. will be coolly objective in his evaluations, his judgment will not be warped by emotional involvements. He will, in other words, closely approximate the logical-theoretical ideal of what a doctor should be . . . and that no one wants for a therapist himself!

Such a doctor is like a highly skilled mercenary soldier; he may be more skillful, more effective in the battle, than a true patriot dedicated to the cause. He fits coolly, effectively, and skillfully—but entirely without loyalty or dedication. He wants his side to win, because that's the side that will pay him for his work.

The man who is dedicated to a cause is, by definition, emotionally involved in it; his evaluations of that cause will not be objective. His judgment will be warped by his involvement.

A parent can not judge his child objectively; an Englishman can't evaluate England's policies in the world objectively, any more than an American can evaluate ours objectively. And a true, dedicated healer-physician can not judge medicine objectively.

Yet each of those—parent, Englishman, American, and doctor—will be sincerely and honestly convinced that he is being objective.

And emotional involvement will make a well-trained, highly-logical scientist become completely unrealizable and unscientific.

It's long been known that it is very unwise of a doctor to treat his own family; his hopes and fears—his emotional involvements—will warp his judgment under precisely the circumstances he most ardently wants to be most effective. It is not ill-intent that warps his judgment, but excess of deep concern!

Strangely, a doctor could be more accurate in his evaluations when treating a man he despised than in treating his own wife or child.

Only the money-hungry status-seeking cynic—the medical mercenary with high skill and no dedication—can remain objective!

There's intense emotion on the part of the patients, too, of course; medicine is a matter of life and death, of health and crippling, of successful living or agony and slow death. No other success can have much value, if health is lost.

This leads to another aspect of the problem, one that affects the medical mercenary as acutely as the dedicated doctor. In our current society, the concept of the Welfare State and Security has spread to a quite unsane degree. People now demand Security against Death and ill health.

The Declaration of Independence was—as it openly states—prepared primarily as a propaganda document. It asserts that Life, Liberty and the Pursuit of Happiness are inalienable rights; this is a self-evident falsity. If they were inalienable, no one would ever have to defend them. The one truly inalienable right is the right to *try—with no guarantee whatever of success*. You have an inalienable right to *try* to live, to *try* to be free—but today, the Welfare-Security concept has promoted the concept that we should *have* those, that we should be guaranteed success in our efforts.

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And—that a doctor should guarantee that there is no risk in his therapy.

The rise of that concept has led to more and more extreme malpractice suits. It used to be that if a woman was unfortunate enough to bear a Mongoloid idiot baby, she and her family would accept it as one of the risks of life and the life-process of reproduction.

Now they sue the doctor.

It used to be that if someone were unlucky and seriously injured in an automobile accident, they sued the driver who nearly killed them.

Now they sue the doctor who stopped by the roadside and rendered first-aid treatment.

Under this philosophy, Jesus' parable of the Good Samaritan would have wound up with the injured man suing the Good Samaritan for restoration of the money the thieves took.

This constitutes a problem for the medical-mercenary as well as the dedicated doctor. Such suits are always based on "second-guessing" the doctor on the job. "If he hadn't done . . . then I believe that . . ." is easy for the second-guessing doctor to say. (And a doctor willing to second-guess under those circumstances is always findable; the unskilled as well as undedicated medical mercenaries specialize in that as a source of income.)

Some human beings are violently allergic to wheat, strawberries or bee stings. This does not prove that wheat, strawberries or bees are deadly, lethal, evil, intolerable, terrible things to be eliminated from the world. It proves that the guy's unlucky in that *he* doesn't fit the world very well. It's not the world's fault—it's his fault.

But the man who turns up allergic to penicillin, thalidomide, MER-29, or some other new and highly useful drug—*he* sues the doctor.

It's a refusal on the part of patients to acknowledge that the act of living involves risk—and he *has* to accept that risk. Oh, no! Not under the Welfare-Security philosophy! He feels he is *guaranteed* success and health.

All of these factors focus in on the problem of new therapies, new drugs—plus one more.

Back before Pasteur discovered germs, Semmelweis discovered a 99.9% successful method of stopping childbed fever. There was a hospital in Vienna, one half of which was run by nuns, and the other half by doctors. The incidence of childbed fever in the doctor's half of the hospital at times ran as high as 90%—nine out of every ten young women who came in to have their babies died of infection. The nuns had a far better record.

The doctors didn't observe that fact particularly; the women of Vienna were acutely aware of it, however. (The human tendency to count your hits, and forget your misses—while the women observed the misses a lot more actively.)

Semmelweis, studying the situation, came to the conclusion that the difference was that the doctors, as part of their routine, performed autopsies on the dead women; the nuns did not. Semmelweis came to the completely false, crackpot notion that it was the odor of death on the doctors' hands that transmitted the disease. It just happened that he picked, as his deodorizer, chlorine water. It did indeed deodorize the doctor's hands; also, quite unknown to

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Semmelweis, it was an extremely powerful antiseptic—the concentration he used would kill anything.

At that time—about a century ago—it wasn't customary to wash the hospital sheets very often, either—until Semmelweis detected the "odor of death" there, too. "Wash 'em! And use chlorine water!"

The death rate from childbed fever among Semmelweis' patients dropped from about 90% to 0.9%.

For this, Semmelweis was thrown out of the hospital by the other doctors, and violently attacked and harassed by the medical profession of Europe.

Why? Because of a certain emotional factor involved.

His work—his absolutely unarguable and shocking success—said "Doctor—healer!—*you* killed those young women. *You* killed them with your dirty hands. They didn't just 'happen to die'; *you killed them!*"

Semmelweis was, of course, a dedicated healer; he could not endure standing idly by, so he was very busily spreading the word to laymen—telling them not to let a doctor examine a woman unless he scrubbed his hands in chlorine water.

There's the old saying "What you don't know won't hurt you." With respect to objective factors, that's obviously false. With respect to emotional things, however—it's true. So long as a doctor could hold off from his own mind the realization that it truly *was* his unclean hands that did it—then he did not have the grinding agony of regret.

Of course, the medical-mercenary type wouldn't have such a reaction; they could be more objective, less emotional. They never had cared particularly anyway—and Semmelweis' techniques would assure them of more patients. (Except for that damnable chlorine water; scrubbing in the stuff ruined the hands and devastated the fingernails. But it might presently be found that a dilute perfume—diluted with the usual 70% alcohol solvent—removed the odor of death just about as effectively.)

Of course, the Philosophical Logical Ideal doctors wouldn't resist Semmelweis' new idea; they wouldn't react to emotional factors like regret or remorse or guilt. And such men wouldn't be doctors worthy of the name, either.

In summary, then, the true, dedicated doctor, by the very nature of his dedication, cannot be an objective scientist; he cannot evaluate new proposed therapies objectively because he is dedicated—has a loyalty to his art. And he will have powerful emotional blocks against learning such lessons as Semmelweis taught, which show unmistakably that the doctor himself has been killing his patients through ignorance.

On top of that, the modern attitude that the patient has a right to perfect security, puts the doctor under terrific pressure to refrain from *any* new therapy.

Now let's consider for a moment what's meant by a "quack" in the medical field.

The usual charge is that a quack is someone who uses an improper treatment, one which does not help, or actually injures the patient, while inducing the patient to pay for this mistreatment, and keeping the patient from going to a licensed doctor and getting the treatment he needs. That a quack is in the

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business solely to make money at the expense of suffering humanity.

Now any time A disapproves of B emotionally, he'll attribute B's actions to some generally demeaned motivation—"just for money" being the most common, with "just for his own pleasure" being runner-up.

Let's be a bit objective about this business of what a quack does. Suppose a man, calling himself Dr. Jones, treats a patient who has a lethal disease, and uses a method that he knows for a positive fact will not save the man's life. He charges fees, and sees to it that the patient doesn't go to any other therapist—just gives him some drugs that do not save him, but let him die slowly.

That set of actions fulfills exactly what the AMA accuses those awful, nasty, wicked quacks of doing.

It is also precisely what an AMA doctor does when he treats a leukemia patient; he *knows* that the standard treatments for leukemia do not work, do not save lives. Leukemia, treated by AMA methods, means death.

The AMA, moreover, does everything in its power to make it impossible for the victim to get treatment from any other therapist who *might* be able to do better, and most certainly couldn't be less effective.

The patient will, moreover, wind up broke, and his family in debt—a charge constantly leveled against those wicked quacks!—by the time he dies.

But this is not quackery, of course.

Why not? Because the doctors know they are doing their best, with the best of intentions—which is strictly an emotional statement.

How about an unlicensed non-M.D. who does his best, with the best of intentions—despite the AMA's convictions that he *must* be evil—and actually does better than the AMA's best?

Oh . . . I see. That never happens, huh. . . ?

Well, it hasn't yet been proven for leukemia . . . but how about that unlicensed non-M.D.—that charlatan, that fraud, who'd gotten crackpot ideas from studying silk-worms and wineries, no less!—who started treating human beings for rabies? That chemist, with only half a brain, Louis Pasteur?

Or how about that licensed M.D. charlatan, expelled from the hospital and the medical society—Semmelweis?

Or take a few other notorious quacks like Lister—who was most violently attacked for his temerity in opening the abdomens of living patients. (Ethical doctors of the time never opened the abdomen until after the patient died.) And Ehrlich, another chemist, who invented the concept of chemotherapy.

Every time someone outside—or even inside!—the field of medicine brings up a break-through discovery, he'll be labeled a quack. The field is too emotional.

He'll be charged with being a fraud, a charlatan out after money, a blood-sucking leech.

Hoxsey had something that appeared to help cancer cases. Standard Operating Procedure of the AMA is to deny it, and charge the innovator with being a fraud, a charlatan, a money-seeking leech. . . .

Hoxsey sued the AMA, Dr. Morris Fishbein, their President, and the Hearst newspapers which published the statement, for libel. He won the case.

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Whether his cure actually worked or not was never investigated; the AMA flatly refused to test it.

But the question of whether Hoxsey was a charlatan, a deliberate fraud, *was tested*. He wasn't. Whether he did, in fact, have a cure has nothing whatever to do with whether or not he was a fraud; a fraud is someone who knowingly and deliberately misstates facts. Hoxsey had excellent evidence to lead him to the conclusion that his cure worked; that fact alone is complete and final proof that he was not illy or fraudulently motivated.

Look—let's be objective. Hoxsey may have been wrong—but the AMA doctor who treats leukemia by methods *he knows* will not save the patient's life seems to me in a damn poor position to call Hoxsey a quack. Hoxsey didn't *know* he couldn't save lives, and did, in fact, have a lot of reason to believe he could. And Hoxsey wasn't urging the passing of laws that would prevent the victim of such a disease from even trying to get help elsewhere.

As I say—this whole business is a mass of tangled, boiling, violent emotions. Does intent count in such matters? How much should it count? How do you know a man's real intentions? The medical mercenary intends to make money and gain status—and he may be the most highly skilled, highly competent surgeon in the city. Another man may be deeply dedicated, completely sincere . . . and unfortunately just not really bright. He lacks the spark that makes real surgeons. So here is one man with the "evil" intention of making money, the medical mercenary, and another who has the best of intentions. And—should we say the incompetent man is a better doctor?

I propose a new approach to this problem.

Let's license quacks. We'll make it wide open; anyone whatever, with no qualifications required save only that he be over twenty-one, and never committed to an institution for insanity, can apply for and get a license to set up in business as a medical quack.

Here's why: If a doctor diagnoses a man and tells him "The disease you have will kill you within three months; there is nothing that we can do to save you. All we can do is give you drugs to ease your pain, and perhaps prolong your life a little," that man is unsane if he does not seek some other therapist. And a man does have an inalienable right to try to live; you may try to stop him, but you'll have to lock him up to prevent his trying to find someone who will offer him some hope.

The fact that there are conditions which can be diagnosed, but which can not be cured by medicine today—and there always will be, no doubt!—is the fundamental reason why there are, and always will be quacks.

A quack is a man who thinks he can help conditions medicine cannot help. A man like Louis Pasteur, treating the Russian victims of rabies with a new technique no doctor in Paris would touch—treating them at the risk of a trial for murder, if they died.

Not all quacks are evil men. And there is a definite place for quackery! The area where medicine is competent to diagnose, and helpless to cure. If medical science can't help—then by all that's honest and ethical, they should

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damn well acknowledge it, step aside, and let someone else try!

Try a witch doctor, a faith healer, a numerologist—try a herbalist, or a chemist with a theory, or maybe a nuclear physicist. When you have nothing to lose, and life to win—*try anything!*

And *don't talk about money!* Whenever emotions start running high—and they always do, everywhere, in medical problems!—the business of money charges gets thrown in as the triumphant "That proves they're wrong! They do it for money!"

Have you taken a look at a standard AMA hospital and doctor bills for a couple of months of cancer treatment, with death of the patient? Talk about money! See, that proves they're just doing it for the money, huh?

Drop that money nonsense out of the thing; it's a question-begging argument from start to finish.

On the patient's side, he has a right to try anything he chooses; the organized medical groups have no right to deny him the right to try.

But there's a doctor's side, too. We're going to license these quacks—but it will be strictly, publicly, and thoroughly understood that it's a matter of "When you choose to gamble—you can't whine if you lose your bet." The quack is absolutely immune to suits for malpractice. Legally declared totally irresponsible for any deaths, crippling, or disasters that may result from his treatments.

This is simply putting into formal, legal and publicly stated terms what exists in fact anytime a man goes to a quack; it is the patient's responsibility to choose his own quack—and to take his licking if he gets licked.

But this means that a licensed M.D., a qualified man with a new theory, a new therapy to try out can *also* take out a license as a quack. He can hang out his shingle as "Thomas R. Brown, M.D., Licensed Quack Specializing in . . ." whatever it may be he's researching.

This would give the doctor a chance to do experimental work, and get out from under that insane business of unlimited malpractice suits. If the patient insists on Security—he goes only to tried-and-true, standardized-technique licensed doctors. If he has a disease in which the standard therapies don't work—he can take his choice of being perfectly secure in his dying, or sticking his neck out and taking a chance on a new therapy.

There's a third side to this system though—Society as a whole. And Society as a whole will benefit enormously from a system of licensed quackery.

Quackery always has existed; it exists now—and it always will exist, for the reasons given above. Diagnosis always precedes therapy; diagnostic techniques will always exist before therapeutic techniques have been able to cure the newly diagnosed conditions. In that twilight zone, quackery exists.

Now, however, quackery is illegal—a hit-and-run business pretty largely. No undercover operation can keep good records, and what records it does keep aren't communicated.

Let's license the quacks . . . and *make them keep extremely careful records.* They'll be the most useful research records Mankind has ever assembled! Even if the quack himself doesn't learn anything, other men very well may, from

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studying the records.

Now, the quacks are unlicensed, and, therefore, unlimited. (They aren't even limited to over twenty-one and no-recorded-insanity!) Licensed, they can be limited in a number of ways—but the ways *will not* include any requirement of degrees or previous training. Put on such limitations, and the unlicensed quacks will immediately pop up where their records won't be available, and their activities will be unrestrained. The only restraint will have to do with two matters of statistics:

1. Only patients diagnosed as having diseases or conditions which standard medical records show to be, say, seventy-five per cent or higher lethal under known treatments will be automatically free to go to a quack if they want to. If the disease or condition is nonlethal, and has a zero cure rate—some skin diseases for example—the patient can ask for and *must be given* a pass to present to a licensed quack. The patient, not the doctor must determine this—because patients who want to go to quacks and are denied the pass will supply a group to maintain unlicensed and unrecorded quacks. But it gives the doctor a chance to point out to a girl with a disfiguring and incurable skin condition that while a *quack* might cure it—he's also quite apt to kill her.

But . . . any quack caught treating someone who does *not* have such a pass loses his license, and gets jailed.

2. The statistics on the quack's records are studied periodically. If his death rate is higher than the death rate under standard treatment—he gets shut down. We want better, not worse, treatments!

The gain to the Society as a whole is that, by such a system, a huge number of things that might work can be explored with the full co-operation and free permission of the self-assigned human guinea pigs. No man *has* to go to a licensed quack; it's his decision to be a human guinea pig. And in the process, we can learn a great deal about a lot of things that don't work—and thereby eliminate duplication of that useless effort.

There's a lot of emotionalism tied up in that concept of the human test subjects, of course. Doctors, when fulminating against quacks, have horrid things to say about such things.

But dedicated doctors, knowing the importance and good intent of what they were doing, aren't so upset when doctors in a major New York hospital, inject live human cancer tissue into human patients without the knowledge or consent of the patients.

That's *different!* That was for a good purpose, and they knew what they were doing!

Actually, it's pretty clear, the definition of "quack" is "someone I believe to be dangerous, evil, destructive and unprincipled."

Trouble is—the term "quack" was—in their own place and time—violently hurled at many men we consider today among the greatest medical heroes. Jenner—Harvey—Ross—Lister—Pasteur—Ehrlich—Sister Kenney—even Roentgen, who didn't even try to practice medicine!

One very certain thing about the field of medicine: it is not, and never will be a field of objective science. It's too deeply dominated by emotional factors.

The Editor.

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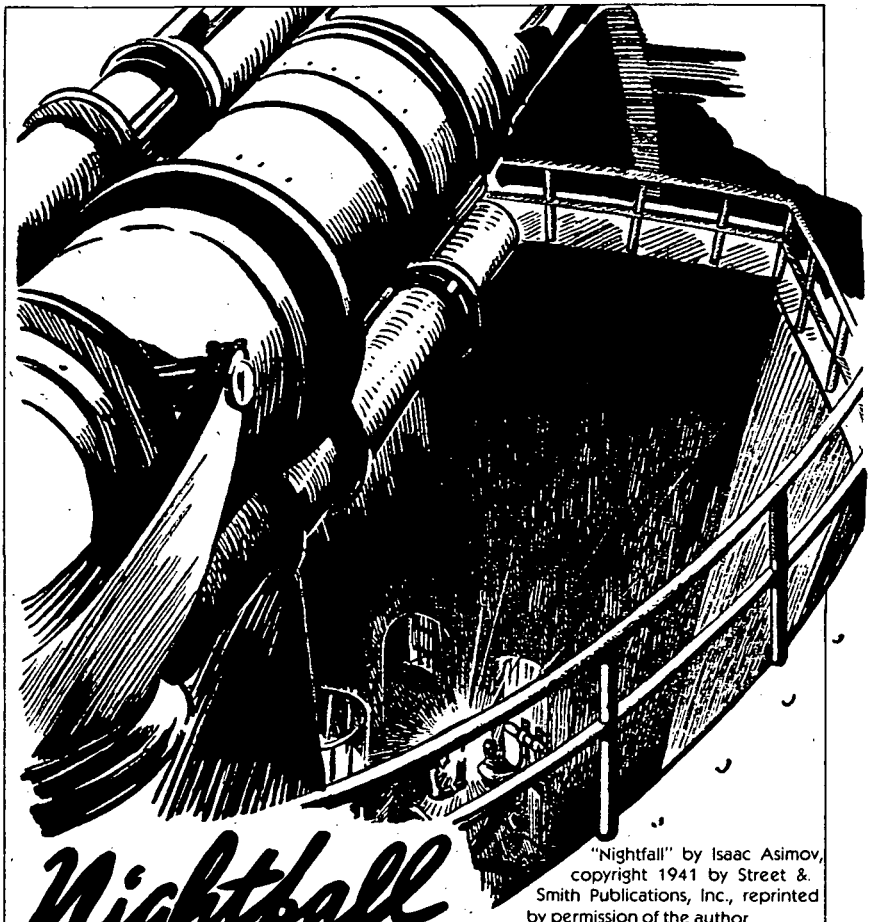

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Nightfall

By Isaac Asimov

How would a people who saw the stars but once in two thousand years react—

Illustrated by Kolliker

"If the stars should appear one night in a thousand years, how would men believe and adore, and preserve for many generations the remembrance of the city of God!—Emerson

Aton 77, director of Saro University, thrust out a lower lip and glared at the young newspaperman in a hot fury.

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Theremon 762 took that fury in his stride. In his earlier days, when his now widely syndicated column was only a mad idea in a cub reporter's mind, he had specialized in "impossible" interviews. It had cost him bruises, black eyes, and broken bones; but it had given him an ample supply of coolness and self-confidence.

So he lowered the outthrust hand that had been so pointedly ignored and calmly waited for the aged director to get over the worst. Astronomers were queer ducks, anyway, and if Aton's actions of the last two months meant anything, this same Aton was the queerduckiest of the lot.

Aton 77 found his voice, and though it trembled with restrained emotion, the careful, somewhat pedantic phraseology, for which the famous astronomer was noted, did not abandon him.

"Sir," he said, "you display an infernal gall in coming to me with that impudent proposition of yours."

The husky telephotographer of the Observatory, Beenay 25, thrust a tongue's tip across dry lips and interposed nervously, "Now, sir, after all—"

The director turned to him and lifted a white eyebrow. "Do not interfere, Beenay. I will credit you with good intentions in bringing this man here; but I will tolerate no insubordination now."

Theremon decided it was time to take a part. "Director Aton, if you'll let me finish what I started saying, I think—"

"I don't believe, young man," retorted Aton, "that anything you could say now would count much as compared with your daily columns of these last two months. You have led a vast newspaper campaign against the efforts of myself and my colleagues to organize the world against the menace which it is now too late to avert. You have done your best with your highly personal attacks to make the staff of this Observatory objects of ridicule."

The director lifted a copy of the Saro City *Chronicle* from the table and shook it at Theremon furiously. "Even a person of your well-known impudence should have hesitated before coming to me with a request that he be allowed to cover today's events for his paper. Of all newsmen, you!"

Aton dashed the newspaper to the floor, strode to the window, and clasped his arms behind his back.

"You may leave," he snapped over his shoulder. He stared moodily out at the skyline where Gamma, the brightest of the planet's six suns, was setting. It had already faded and yellowed into the horizon mists, and Aton knew he would never see it again as a sane man.

He whirled. "No, wait, come here!" He gestured peremptorily. "I'll give you your story."

The newsman had made no motion to leave, and now he approached the old man slowly. Aton gestured outward. "Of the six suns, only Beta is left in the sky. Do you see it?"

The question was rather unnecessary. Beta was almost at zenith, its ruddy light flooding the landscape to an unusual orange as the brilliant rays of setting Gamma died. Beta was at aphelion. It was small; smaller than Theremon had ever seen it before, and for the moment it was undisputed ruler of Lagash's sky.

Lagash's own sun, Alpha, the one about which it revolved, was at the antipodes, as were the two distant com-

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panion pairs. The red dwarf Beta—Alpha's immediate companion—was alone, grimly alone.

Aton's upturned face flushed redly in the sunlight. "In just under four hours," he said, "civilization, as we know it, comes to an end. It will do so because, as you see, Beta is the only sun in the sky." He smiled grimly. "Print that! There'll be no one to read it."

"But if it turns out that four hours pass—and another four—and nothing happens?" asked Theremon softly.

"Don't let that worry you. Enough will happen."

"Granted! And *still*—if nothing happens?"

For a second time, Beenay 25 spoke. "Sir, I think you ought to listen to him."

Theremon said, "Put it to a vote, Director Aton."

There was a stir among the remaining five members of the Observatory staff, who till now had maintained an attitude of wary neutrality.

"That," stated Aton flatly, "is not necessary." He drew out his pocket watch. "Since your good friend, Beenay, insists so urgently, I will give you five minutes. Talk away."

"Good! Now, just what difference would it make if you allowed me to take down an eyewitness account of what's to come? If your prediction comes true, my presence won't hurt; for in that case my column would never be written. On the other hand, if nothing comes of it, you will just have to expect ridicule or worse. It would be wise to leave that ridicule to friendly hands."

Aton snorted. "Do you mean yours when you speak of friendly hands?"

"Certainly!" Theremon sat down and crossed his legs. "My columns may have been a little rough, but I gave you people the benefit of the doubt every time. After all, this is not the century to preach 'The end of the world is at hand' to Lagash. You have to understand that people don't believe the *Book of Revelations* anymore, and it annoys them to have scientists turn about-face and tell us the Cultists are right after all—"

"No such thing, young man," interrupted Aton. "While a great deal of our data has been supplied us by the Cult, our results contain none of the Cult's mysticism. Facts are facts, and the Cult's so-called mythology *has* certain facts behind it. We've exposed them and ripped away their mystery. I assure you that the Cult hates us now worse than you do."

"I don't hate you. I'm just trying to tell you that the public is in an ugly humor. They're angry."

Aton twisted his mouth in derision. "Let them be angry."

"Yes, but what about tomorrow?"

"There'll be no tomorrow!"

"But if there is. Say that there is—just to see what happens. That anger might take shape into something serious. After all, you know, business has taken a nosedive these last two months. Investors don't really believe the world is coming to an end, but just the same they're being cagy with their money until it's all over. Johnny Public doesn't believe you, either, but the new spring furniture might just as well wait a few months—just to make sure.

"You see the point. Just as soon as this is all over, the business interests

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will be after your hide. They'll say that if crackpots—begging your pardon—can upset the country's prosperity any time they want, simply by making some cockeyed prediction—it's up to the planet to prevent them. The sparks will fly, sir."

The director regarded the columnist sternly. "And just what were you proposing to do to help the situation?"

"Well"—Theremon grinned—"I was proposing to take charge of the publicity. I can handle things so that only the ridiculous side will show. It would be hard to stand, I admit, because I'd have to make you all out to be a bunch of gibbering idiots, but if I can get people laughing at you, they might forget to be angry. In return for that, all my publisher asks is an exclusive story."

Beenay nodded and burst out, "Sir, the rest of us think he's right. These last two months we've considered everything but the million-to-one chance that there is an error somewhere in our theory or in our calculations. We ought to take care of that, too."

There was a murmur of agreement from the men grouped about the table, and Aton's expression became that of one who found his mouth full of something bitter and couldn't get rid of it.

"You may stay if you wish, then. You will kindly refrain, however, from hampering us in our duties in any way. You will also remember that I am in charge of all activities here, and in spite of your opinions as expressed in your columns, I will expect full cooperation and full respect—"

His hands were behind his back, and his wrinkled face thrust forward determinedly as he spoke. He might have continued indefinitely but for the intrusion of a new voice.

"Hello, hello, hello!" It came in a high tenor, and the plump cheeks of the newcomer expanded in a pleased smile. "What's this morgue-like atmosphere about here? No one's losing his nerve, I hope."

Aton started in consternation and said peevishly, "Now what the devil are you doing here, Sheerin? I thought you were going to stay behind in the Hideout."

Sheerin laughed and dropped his stubby figure into a chair. "Hideout be blowed! The place bored me. I wanted to be here, where things are getting hot. Don't you suppose I have my share of curiosity? I want to see these Stars the Cultists are forever speaking about." He rubbed his hands and added in a soberer tone, "It's freezing outside. The wind's enough to hang icicles on your nose. Beta doesn't seem to give any heat at all, at the distance it is."

The white-haired director ground his teeth in sudden exasperation. "Why do you go out of your way to do crazy things, Sheerin? What kind of good are you around here?"

"What kind of good am I around there?" Sheerin spread his palms in comical resignation. "A psychologist isn't worth his salt in the Hideout. They need men of action and strong, healthy women that can breed children. Me? I'm a hundred pounds too heavy for a man of action, and I wouldn't be a success at breeding children. So why bother them with an extra mouth to feed? I feel better over here."

Theremon spoke briskly. "Just what is the Hideout, sir?"

Sheerin seemed to see the columnist

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for the first time. He frowned and blew his ample cheeks out. "And just who in Lagash are you, redhead?"

Aton compressed his lips and then muttered sullenly, "That's Theremon 762, the newspaper fellow. I suppose you've heard of him."

The columnist offered his hand. "And, of course, you're Sheerin 501 of Saro University. I've heard of you." Then he repeated, "What is this Hideout, sir?"

"Well," said Sheerin, "we have managed to convince a few people of the validity of our prophecy of—er—doom, to be spectacular about it, and those few have taken proper measures. They consist mainly of the immediate members of the families of the Observatory staff, certain of the faculty of Saro University, and a few outsiders. Altogether, they number about three hundred, but three-quarters are women and children."

"I see! They're suppose to hide where the Darkness and the—er—Stars can't get at them, and then hold out when the rest of the world goes poof."

"If they can. It won't be easy. With all of mankind insane, with the great cities going up in flames—environment will not be conducive to survival. But they have food, water, shelter, and weapons—"

"They've got more," said Aton. "They've got all our records, except for what we will collect today. Those records will mean everything to the next cycle, and *that's* what must survive. The rest can go hang."

Theremon uttered a long, low whistle and sat brooding for several minutes. The men about the table had brought out a multi-chess board and started a six-member game. Moves were made rapidly and in silence. All eyes bent in furious concentration on the board. Theremon watched them intently and then rose and approached Aton, who sat apart in whispered conversation with Sheerin.

"Listen," he said, "let's go somewhere where we won't bother the rest of the fellows. I want to ask some questions."

The aged astronomer frowned sourly at him, but Sheerin chirped up, "Certainly. It will do me good to talk. It always does. Aton was telling me about your ideas concerning world reaction to a failure of the prediction—and I agree with you. I read your column pretty regularly, by the way, and as a general thing I like your views."

"Please, Sheerin," growled Anton.

"Eh? Oh, all right. We'll go into the next room. It has softer chairs, anyway."

There were softer chairs in the next room. There were also thick red curtains on the windows and a maroon carpet on the floor. With the bricky light of Beta pouring in, the general effect was one of dried blood.

Theremon shuddered. "Say, I'd give ten credits for a decent dose of white light for just a second. I wish Gamma or Delta were in the sky."

"What are your questions?" asked Aton. "Please remember that our time is limited. In a little over an hour and a quarter we're going upstairs, and after that there will be no time for talk."

"Well, here it is." Theremon leaned back and folded his hands on his chest. "You people seem so all-fired serious

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about this that I'm beginning to believe you. Would you mind explaining what it's all about?"

Aton exploded, "Do you mean to sit there and tell me that you've been bombarding us with ridicule without even finding out what we've been trying to say?"

The columnist grinned sheepishly. "It's not that bad, sir. I've got the general idea. You say there is going to be a world-wide Darkness in a few hours and that all mankind will go violently insane. What I want now is the science behind it."

"No, you don't. No, you don't," broke in Sheerin. "If you ask Aton for that—supposing him to be in the mood to answer at all—he'll trot out pages of figures and volumes of graphs. You won't make head or tail of it. Now if you were to ask me, I could give you the layman's standpoint."

"All right; I ask you."

"Then first I'd like a drink." He rubbed his hands and looked at Aton.

"Water?" grunted Aton.

"Don't be silly!"

"Don't you be silly. No alcohol today. It would be too easy to get my men drunk. I can't afford to tempt them."

The psychologist grumbled wordlessly. He turned to Theremon, impaled him with his sharp eyes, and began.

"You realize, of course, that the history of civilization on Lagash displays a cyclic character—but I mean, *cyclic!*"

"I know," replied Theremon cautiously, "that that is the current archaeological theory. Has it been accepted as a fact?"

"Just about. In this last century it's been generally agreed upon. This cyclic character is—or rather, was—one of the great mysteries. We've located series of civilizations, nine of them definitely, and indications of others as well, all of which have reached heights comparable to our own, and all of which, without exception, were destroyed by fire at the very height of their culture.

"And no one could tell why. All centers of culture were thoroughly gutted by fire, with nothing left behind to give a hint as to the cause."

Theremon was following closely. "Wasn't there a Stone Age, too?"

"Probably, but as yet practically nothing is known of it, except that men of that age were little more than rather intelligent apes. We can forget about that."

"I see. Go on!"

"There have been explanations of these recurrent catastrophes, all of a more or less fantastic nature. Some say that there are periodic rains of fire; some that Lagash passes through a sun every so often; some even wilder things. But there is one theory, quite different from all of these, that has been handed down over a period of centuries."

"I know. You mean this myth of the 'Stars' that the Cultists have in their *Book of Revelations*."

"Exactly," rejoined Sheerin with satisfaction. "The Cultists said that every two thousand and fifty years Lagash entered a huge cave, so that all the suns disappeared, and there came *total darkness all over the world!* And then, they say, things called Stars appeared, which robbed men of their souls and left them unreasoning brutes, so that they destroyed the civilization they themselves had built up. Of course they mix

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all this up with a lot of religio-mystic notions, but that's the central idea."

There was a short pause in which Sheerin drew a long breath. "And now we come to the Theory of Universal Gravitation." He pronounced the phrase so that the capital letters sounded—and at that point Aton turned from the window, snorted loudly, and stalked out of the room.

The two stared after him, and Theremon said, "What's wrong?"

"Nothing in particular," replied Sheerin. "Two of the men were due several hours ago and haven't shown up yet. He's terrifically short-handed, of course, because all but the really essential men have gone to the Hideout."

"You don't think the two deserted, do you?"

"Who? Faro and Yimot? Of course not. Still, if they're not back within the hour, things would be a little sticky." He got to his feet suddenly, and his eyes twinkled. "Anyway, as long as Aton is gone—"

Tiptoeing to the nearest window, he squatted, and from the low window box beneath withdrew a bottle of red liquid that gurgled suggestively when he shook it.

"I *thought* Aton didn't know about this," he remarked as he trotted back to the table. "Here! We've only got one glass so, as the guest, you can have it. I'll keep the bottle." And he filled the tiny cup with judicious care.

Theremon rose to protest, but Sheerin eyed him sternly. "Respect your elders, young man."

The newsman seated himself with a look of anguish on his face. "Go ahead, then, you old villain."

The psychologist's Adam's apple wobbled as the bottle upended, and then, with a satisfied grunt and a smack of the lips, he began again. "But what do you know about gravitation?"

"Nothing, except that it is a very recent development, not too well established, and that the math is so hard that only twelve men in Lagash are supposed to understand it."

"*Tcha!* Nonsense! Baloney! I can give you all the essential math in a sentence. The Law of Universal Gravitation states that there exists a cohesive force among all bodies of the universe, such that the amount of this force between any two given bodies is proportional to the product of their masses divided by the square of the distance between them."

"Is that all?"

"That's enough! It took four hundred years to develop it."

"Why that long? It sounded simple enough, the way you said it."

"Because great laws are not divined by flashes of inspiration, whatever you may think. It usually takes the combined work of a world full of scientists over a period of centuries. After Genovi 41 discovered that Lagash rotated about the sun Alpha rather than vice versa—and that was four hundred years ago—astronomers have been working. The complex motions of the six suns were recorded and analyzed and unwoven. Theory after theory was advanced and checked and counterchecked and modified and abandoned and revived and converted to something else. It was a devil of a job."

Theremon nodded thoughtfully and held out his glass for more liquor.

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Sheerin grudgingly allowed a few ruby drops to leave the bottle.

"It was twenty years ago," he continued after remoistening his own throat, "that it was finally demonstrated that the Law of Universal Gravitation accounted exactly for the orbital motions of the six suns. It was a great triumph."

Sheerin stood up and walked to the window, still clutching his bottle. "And now we're getting to the point. In the last decade, the motions of Lagash about Alpha were computed according to gravity, and *it did not account for the orbit observed;* not even when all perturbations due to the other suns were included. Either the law was invalid, or there was another, as yet unknown, factor involved."

Theremon joined Sheerin at the window and gazed out past the wooded slopes to where the spires of Saro City gleamed bloodily on the horizon. The newsman felt the tension of uncertainty grow within him as he cast a short glance at Beta. It glowered redly at zenith, dwarfed and evil.

"Go ahead, sir," he said softly.

Sheerin replied, "Astronomers stumbled about for years, each proposed theory more untenable than the one before—until Aton had the inspiration of calling in the Cult. The head of the Cult, Sor 5, had access to certain data that simplified the problem considerably. Aton set to work on a new track.

"What if there were another nonluminous planetary body such as Lagash? If there were, you know, it would shine only by reflected light, and if it were composed of bluish rock, as Lagash itself largely is, then, in the redness of the sky, the eternal blaze of the suns would make it invisible—drown it out completely."

Theremon whistled. "What a screwy idea!"

"You think *that's* screwy? Listen to this: Suppose this body rotated about Lagash at such a distance and in such an orbit and had such a mass that its attraction would exactly account for the deviations of Lagash's orbit from theory—do you know what would happen?"

The columnist shook his head.

"Well, sometimes this body would get in the way of a sun." And Sheerin emptied what remained in the bottle at a draft.

"And it does, I suppose," said Theremon flatly.

"Yes! But only one sun lies in its plane of revolution." He jerked a thumb at the shrunken sun above. "Beta! And it has been shown that the eclipse will occur only when the arrangement of the suns is such that Beta is alone in its hemisphere and at maximum distance, at which time the moon is invariably at minimum distance. The eclipse that results, with the moon seven times the apparent diameter of Beta, covers all of Lagash and lasts well over half a day, so that no spot on the planet escapes the effects. *That eclipse comes once every two thousand and forty-nine years.*"

Theremon's face was drawn into an expressionless mask. "And that's my story?"

The psychologist nodded. "That's all of it. First the eclipse—which will start in three quarters of an hour—then universal Darkness and, maybe, these mysterious Stars—then madness, and end of the cycle."

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He brooded. "We had two months' leeway—we at the Observatory—and that wasn't enough time to persuade Lagash of the danger. Two centuries might not have been enough. But our records are at the Hideout, and today we photograph the eclipse. The next cycle will *start off* with the truth, and when the *next* eclipse comes, mankind will at last be ready for it. Come to think of it, that's part of your story too."

A thin wind ruffled the curtains at the window as Theremon opened it and leaned out. It played coldly with his hair as he stared at the crimson sunlight on his hand. Then he turned in sudden rebellion.

"What is there in Darkness to drive *me* mad?"

Sheerin smiled to himself as he spun the empty liquor bottle with abstracted motions off his hand. "Have you ever experienced Darkness, young man?"

The newsman leaned against the wall and considered. "No. Can't say I have. But I know what it is. Just—uh—" He made vague motions with his fingers and then brightened. "Just no light. Like in caves."

"Have you ever been in a cave?"

"In a *cave!* Of course not!"

"I thought not. *I* tried last week—just to see—but I got out in a hurry. I went in until the mouth of the cave was just visible as a blur of light, with black everywhere else. I never thought a person my weight could run that fast."

Theremon's lip curled. "Well, if it comes to that, I guess I wouldn't have run if I had been there."

The psychologist studied the young man with an annoyed frown.

"My, don't you talk big! I dare you to draw the curtain."

Theremon looked his surprise and said, "What for? If we had four or five suns out there, we might want to cut the light down a bit for comfort, but now we haven't enough light as it is."

"That's the point. Just draw the curtain; then come here and sit down."

"All right." Theremon reached for the tasseled string and jerked. The red curtain slid across the wide window, the brass rings hissing their way along the crossbar, and a dusk-red shadow clamped down on the room.

Theremon's footsteps sounded hollowly in the silence as he made his way to the table, and then they stopped halfway. "I can't see you, sir," he whispered.

"Feel your way," ordered Sheerin in a strained voice.

"But I can't see you, sir." The newsman was breathing harshly. "I can't see anything."

"What did you expect?" came the grim reply. "Come here and sit down!"

The footsteps sounded again, waveringly, approaching slowly. There was the sound of someone fumbling with a chair. Theremon's voice came thinly, "Here I am. I feel . . . *ulp* . . . all right."

"You like it, do you?"

"N—no. It's pretty awful. The walls seem to be—" He paused. "They seem to be closing in on me. I keep wanting to push them away. But I'm not going *mad!* In fact, the feeling isn't as bad as it was."

"All right. Draw the curtain back again."

There were cautious footsteps through

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the dark, the rustle of Theremon's body against the curtain as he felt for the tassel, and then the triumphant *ro-o-osh* of the curtain slithering back. Red light flooded the room, and with a cry of joy Theremon looked up at the sun.

Sheerin wiped the moistness off his forehead with a back of a hand and said shakily, "And that was just a dark room."

"It can be stood," said Theremon lightly.

"Yes, a dark room can. But were you at the Jonglor Centennial Exposition two years ago?"

"No, it so happens I never got around to it. Six thousand miles was just a bit too much to travel, even for the exposition."

"Well, I was there. You remember hearing about the 'Tunnel of Mystery' that broke all records in the amusement area—for the first month or so, anyway?"

"Yes. Wasn't there some fuss about it?"

"Very little. It was hushed up. You see, that Tunnel of Mystery was just a mile-long tunnel—with no lights. You got into a little open car and jolted along through Darkness for fifteen minutes. It was very popular—while it lasted."

"Popular?"

"Certainly. There's a fascination in being frightened *when it's part of a game*. A baby is born with three instinctive fears: of loud noises, of falling, and of the absence of light. That's why its considered so funny to jump at someone and shout 'Boo!' That's why it's such fun to ride a roller coaster. And that's why that Tunnel of Mystery started cleaning up. People came out of that Darkness shaking, breathless, half dead with fear, but they kept on paying to get in."

"Wait a while, I remember now. Some people came out dead, didn't they? There were rumors of that after it shut down."

The psychologist snorted. "Bah! Two or three died. That was nothing! They paid off the families of the dead ones and argued the Jonglor City Council into forgetting it. After all, they said, if people with weak hearts want to go through the tunnel, it was at their own risk—and besides, it wouldn't happen again. So they put a doctor in the front office and had every customer go through a physical examination before getting into the car. That actually *boosted* ticket sales."

"Well, then?"

"But you see, there was something else. People sometimes came out in perfect order, except that they refused to go into buildings—any building; including palaces, mansions, apartment houses, tenements, cottages, huts, shacks, lean-tos, and tents."

Theremon looked shocked. "You mean they refused to come in out of the open? Where'd they sleep?"

"In the open."

"They should have *forced* them inside."

"Oh, they did, they did. Whereupon these people went into violent hysterics and did their best to bat their brains out against the nearest wall. Once you got them inside, you couldn't keep them there without a strait jacket or a heavy dose of tranquilizer."

"They must have been crazy."

"Which is exactly what they were. One person out of every ten who went

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into that tunnel came out that way. They called in the psychologists, and we did the only thing possible. We closed down the exhibit." He spread his hands.

"What was the matter with these people?" asked Theremon finally.

"Essentially the same thing that was the matter with you when you thought the walls of the room were crushing in on you in the dark. There is a psychological term for mankind's instinctive fear of the absence of light. We call it 'claustrophobia,' because the lack of light is always tied up with enclosed places, so that fear of one is fear of the other. You see?"

"And those people of the tunnel?"

"Those people of the tunnel consisted of those unfortunates whose mentality did not quite possess the resiliency to overcome the claustrophobia that overtook them in the Darkness. Fifteen minutes without light is a long time; you only had two or three minutes, and I believe you were fairly upset.

"The people of the tunnel had what is called a 'claustrophobic fixation.' Their latent fear of Darkness and enclosed places had crystalized and become active, and, as far as we can tell, permanent. That's what fifteen minutes in the dark will do."

There was a long silence, and Theremon's forehead wrinkled slowly into a frown. "I don't believe it's that bad."

"You mean you don't want to believe," snapped Sheerin. "You're afraid to believe. Look out the window!"

Theremon did so, and the psychologist continued without pausing. "Imagine Darkness—everywhere. No light, as far as you can see. The houses, the trees, the fields, the earth, the sky —black! And Stars thrown in, for all I know—whatever *they* are. Can you conceive it?"

"Yes, I can," declared Theremon truculently.

And Sheerin slammed his fist down upon the table in sudden passion. "You lie! You can't conceive that. Your brain wasn't built for the conception any more than it was built for the conception of infinity or of eternity. You can only talk about it. A fraction of the reality upsets you, and when the real thing comes, your brain is going to be presented with the phenomenon outside its limits of comprehension. You will go mad, completely and permanently! There is no question of it!"

He added sadly, "And another couple of millennia of painful struggle comes to nothing. Tomorrow there won't be a city standing unharmed in all Lagash."

Theremon recovered part of his mental equilibrium. "That doesn't follow. I still don't see that I can go loony just because there isn't a sun in the sky—but even if I did, and everyone else did, how does that harm the cities? Are we going to blow them down?"

But Sheerin was angry, too. "If you were in Darkness, what would you want more than anything else; what would it be that every instinct would call for? Light, damn you, *light!*"

"Well?"

"And how would you get light?"

"I don't know," said Theremon flatly.

"What's the *only* way to get light, short of a sun?"

"How should I know?"

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They were standing face to face and nose to nose.

Sheerin said, "You burn something, mister. Ever see a forest fire? Ever go camping and cook a stew over a wood fire? Heat isn't the only thing burning wood gives off, you know. It gives off light, and people know that. And when it's dark they want light, and they're going to *get* it."

"So they burn wood?"

"So they burn whatever they can get. They've got to have light. They've got to burn something, and wood isn't handy—so they'll burn whatever is nearest. They'll have their light—and every center of habitation goes up in flames!"

Eyes held each other as though the whole matter were a personal affair of respective will powers, and then Theremon broke away wordlessly. His breathing was harsh and ragged, and he scarcely noted the sudden hubbub that came from the adjoining room behind the closed door.

Sheerin spoke, and it was with an effort that he made it sound matter-of-fact. "I think I heard Yimot's voice. He and Faro are probably back. Let's go in and see what kept them."

"Might as well!" muttered Theremon. He drew a long breath and seemed to shake himself. The tension was broken.

The room was in an uproar, with members of the staff clustering about two young men who were removing outer garments even as they parried the miscellany of questions being thrown at them.

Aton bustled through the crowd and faced the newcomers angrily. "Do you realize that it's less than half an hour before deadline? Where have you two been?"

Faro 24 seated himself and rubbed his hands. His cheeks were red with the outdoor chill. "Yimot and I have just finished carrying through a little crazy experiment of our own. We've been trying to see if we couldn't construct an arrangement by which we could simulate the appearance of Darkness and Stars so as to get an advance notion as to how it looked."

There was a confused murmur from the listeners, and a sudden look of interest entered Aton's eyes. "There wasn't anything said of this before. How did you go about it?"

"Well," said Faro, "the idea came to Yimot and myself long ago, and we've been working it out in our spare time. Yimot knew of a low one-story house down in the city with a domed roof—it had once been used as a museum, I think. Anyway, we bought it—"

"Where did you get the money?" interrupted Aton peremptorily.

"Our bank accounts," grunted Yimot 70. "It cost two thousand credits." Then, defensively, "Well, what of it? Tomorrow, two thousand credits will be two thousand pieces of paper. That's all."

"Sure," agreed Faro. "We bought the place and rigged it up with black velvet from top to bottom so as to get as perfect a Darkness as possible. Then we punched tiny holes in the ceiling and through the roof and covered them with little metal caps, all of which could be shoved aside simultaneously at the close

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of a switch. At least we didn't do that part ourselves; we got a carpenter and a electrician and some others—money didn't count. The point was that we could get the light to shine through those holes in the roof, so that we could get a starlike effect."

Not a breath was drawn during the pause that followed. Aton said stiffly, "You had no right to make a private—"

Faro seemed abashed. "I know, sir—but frankly, Yimot and I thought the experiment was a little dangerous. If the effect really worked, we half expected to go mad—from what Sheerin says about all this, we thought that would be rather likely. We wanted to take a risk ourselves. Of course if we found we could retain sanity, it occurred to us that we might develop immunity to the real thing, and then expose the rest of you the same way. But things didn't work out at all—"

"Why, what happened?"

It was Yimot who answered. "We shut ourselves in and allowed our eyes to get accustomed to the dark. It's an extremely creepy feeling because the total Darkness makes you feel as if the walls and ceiling are crushing in on you. But we got over that and pulled the switch. The caps fell away and the roof glittered all over with little dots of light—"

"Well?"

"Well—nothing. That was the whacky part of it. Nothing happened. It was just a roof with holes in it, and that's just what it looked like. We tried it over and over again—that's what kept us so late—but there just isn't any effect at all."

There followed a shocked silence, and all eyes turned to Sheerin, who sat motionless, mouth open.

Theremon was the first to speak. "You know what this does to this whole theory you've built up, Sheerin, don't you?" He was grinning with relief.

But Sheerin raised his hand. "Now wait a while. Just let me think this through." And then he snapped his fingers, and when he lifted his head there was neither surprise nor uncertainty in his eyes. "Of course—"

He never finished. From somewhere up above there sounded a sharp clang, and Beenay, starting to his feet, dashed up the stairs with a "What the devil!"

The rest followed after.

Things happened quickly. Once up in the dome, Beenay cast one horrified glance at the shattered photographic plates and at the man bending over them; and then hurled himself fiercely at the intruder, getting a death grip on his throat. There was a wild threshing, and as others of the staff joined in, the stranger was swallowed up and smothered under the weight of half a dozen angry men.

Aton came up last, breathing heavily. "Let him up!"

There was a reluctant unscrambling and the stranger, panting harshly, with his clothes torn and his forehead bruised, was hauled to his feet. He had a short yellow beard curled elaborately in the style affected by the Cultists.

Beenay shifted his hold to a collar grip and shook the man savagely. "All right, rat, what's the idea? These plates—"

"I wasn't after *them*," retorted the Cultist coldly. "That was an accident."

Beenay followed his glowering stare

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and snarled, "I see. You were after the cameras themselves. The accident with the plates was a stroke of luck for you, then. If you had touched Snapping Bertha or any of the others, you would have died by slow torture. As it is—" He drew his fist back.

Aton grabbed his sleeve. "Stop that! Let him go!"

The young technician wavered, and his arm dropped reluctantly. Aton pushed him aside and confronted the Cultist. "You're Latimer, aren't you?"

The Cultist bowed stiffly and indicated the symbol upon his hip. "I am Latimer 25, adjutant of the third class to his serenity, Sor 5."

"And"—Aton's white eyebrows lifted—"you were with his serenity when he visited me last week, weren't you?"

Latimer bowed a second time.

"Now, then, what do you want?"

"Nothing that you would give me of your own free will."

"Sor 5 sent you, I suppose—or is this your own idea?"

"I won't answer that question."

"Will there be any further visitors?"

"I won't answer that, either."

Aton glanced at his timepiece and scowled. "Now, man, what is it your master wants of me? I have fulfilled my end of the bargain."

Latimer smiled faintly, but said nothing.

"I asked him," continued Aton angrily, "for data only the Cult could supply, and it was given to me. For that, thank you. In return I promised to prove the essential truth of the creed of the Cult."

"There was no need to prove that," came the proud retort. "It stands proven by the *Book of Revelations*."

"For the handful that constitute the Cult, yes. Don't pretend to mistake my meaning. I offered to present scientific backing for your beliefs. And I did!"

The Cultist's eyes narrowed bitterly. "Yes, you did—with a fox's subtlety, for your pretended explanation backed our beliefs, and at the same time removed all necessity for them. You made of the Darkness and of the Stars a natural phenomenon and removed all its real significance. That was blasphemy."

"If so, the fault isn't mine. The facts exist. What can I do but state them?"

"Your 'facts' are a fraud and a delusion."

Aton stamped angrily. "How do you know?"

And the answer came with the certainty of absolute faith. "I know!"

The director purpled and Beenay whispered urgently. Aton waved him silent. "And what does Sor 5 want us to do? He still thinks, I suppose, that in trying to warn the world to take measures against the menace of madness, we are placing innumerable souls in jeopardy. We aren't succeeding, if that means anything to him."

"The attempt itself has done harm enough, and your vicious effort to gain information by means of your devilish instruments must be stopped. We obey the will of the Stars, and I only regret that my clumsiness prevented me from wrecking your infernal devices."

"It wouldn't have done you too much good," returned Aton. "All our data, except for the direct evidence we intend collecting right now, is already safely cached and well beyond possibility of

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harm." He smiled grimly. "But that does not affect your present status as an attempted burglar and criminal."

He turned to the men behind him. "Someone call the police at Saro City."

There was a cry of distaste from Sheerin. "Damn it, Aton, what's wrong with you? There's no time for that. Here"—he bustled his way forward —"let me handle this."

Aton stared down his nose at the psychologist. "This is not the time for your monkeyshines, Sheerin. Will you please let me handle this my own way? Right now you are a complete outsider here, and don't forget it."

Sheerin's mouth twisted eloquently. "Now why should we go to the impossible trouble of calling the police—with Beta's eclipse a matter of minutes from now—when this young man here is perfectly willing to pledge his word of honor to remain and cause no trouble whatsoever?"

The Cultist answered promptly, "I will do no such thing. You're free to do what you want, but it's only fair to warn you that just as soon as I get my chance I'm going to finish what I came out here to do. If it's my word of honor you're relying on, you'd better call the police."

Sheerin smiled in a friendly fashion. "You're a determined cuss, aren't you? Well, I'll explain something. Do you see that young man at the window? He's a strong, husky fellow, quite handy with his fists, and he's an outsider besides. Once the eclipse starts there will be nothing for him to do except keep an eye on you. Besides him, there will be myself—a little too stout for active fisticuffs, but still able to help."

"Well, what of it?" demanded Latimer frozenly.

"Listen and I'll tell you," was the reply. "Just as soon as the eclipse starts, we're going to take you, Theremon and I, and deposit you in a little closet with one door, to which is attached one giant lock and no windows. You will remain there for the duration."

"And afterward," breathed Latimer fiercely, "there'll be no one to let me out. I know as well as you do what the coming of the Stars means—I know it far better than you. With all your minds gone, you are not likely to free me. Suffocation or slow starvation, is it? About what I might have expected from a group of scientists. But I don't give my word. It's a matter of principle, and I won't discuss it further."

Aton seemed perturbed. His faded eyes were troubled. "Really, Sheerin, locking him—"

"Please!" Sheerin motioned him impatiently to silence. "I don't think for a moment things will go that far. Latimer has just tried a clever little bluff, but I'm not a psychologist just because I like the sound of the word." He grinned at the Cultist. "Come now, you don't really think I'm trying anything as crude as slow starvation. My dear Latimer, if I lock you in the closet, you are not going to see the Darkness, and you are not going to see the Stars. It does not take much knowledge of the fundamental creed of the Cult to realize that for you to be hidden from the Stars when they appear means the loss of your immortal soul. Now, I believe you to be an honorable man. I'll accept your word of honor to make no further effort

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to disrupt proceedings, if you'll offer it."

A vein throbbed in Latimer's temple, and he seemed to shrink within himself as he said thickly, "You have it!" And then he added with swift fury, "But it is my consolation that you will all be damned for your deeds of today." He turned on his heel and stalked to the high three-legged stool by the door.

Sheerin nodded to the columnist. "Take a seat next to him, Theremon —just as a formality. Hey, Theremon!"

But the newspaperman didn't move. He had gone pale to the lips. "Look at that!" The finger he pointed toward the sky shook, and his voice was dry and cracked.

There was one simultaneous gasp as every eye followed the pointing finger and, for one breathless moment, stared frozenly.

Beta was chipped on one side!

The tiny bit of encroaching blackness was perhaps the width of a fingernail, but to the staring watchers it magnified itself into the crack of doom.

Only for a moment they watched, and after that there was a shrieking confusion that was even shorter of duration and which gave way to an orderly scurry of activity—each man at his prescribed job. At the crucial moment there was no time for emotion. The men were merely scientists with work to do. Even Aton had melted away.

Sheerin said prosaically, "First contact must have been made fifteen minutes ago. A little early, but pretty good considering the uncertainties involved in the calculation." He looked about him and then tiptoed to Theremon, who still remained staring out the window, and dragged him away gently.

"Aton is furious," he whispered, "so stay away. He missed first contact on account of this fuss with Latimer, and if you get in his way he'll have you thrown out the window."

Theremon nodded shortly and sat down. Sheerin stared in surprise at him.

"The devil, man," he exclaimed, "you're shaking."

"Eh?" Theremon licked dry lips and then tried to smile. "I don't feel very well, and that's a fact."

The psychologist's eyes hardened. "You're not losing your nerve?"

"No!" cried Theremon in a flash of indignation. "Give me a chance, will you? I haven't really believed this rigmarole—not way down beneath, anyway—till just this minute. Give me a chance to get used to the idea. You've been preparing yourself for two months or more."

"You're right, at that," replied Sheerin thoughtfully. "Listen! Have you got a family—parents, wife, children?"

Theremon shook his head. "You mean the Hideout, I suppose. No, you don't have to worry about that. I have a sister, but she's two thousand miles away. I don't even know her exact address."

"Well, then, what about yourself? You've got time to get there, and they're one short anyway, since I left. After all, you're not needed here, and you'd make a darned fine addition—"

Theremon looked at the other wearily. "You think I'm scared stiff, don't you? Well, get this, mister, I'm a news-

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paperman and I've been assigned to cover a story. I intend covering it."

There was a faint smile on the psychologist's face. "I see. Professional honor, is that it?"

"You might call it that. But, man, I'd give my right arm for another bottle of that sockeroo juice even half the size of the one you hogged. If ever a fellow needed a drink, I do."

He broke off. Sheerin was nudging him violently. "Do you hear that? Listen!"

Theremon followed the motion of the other's chin and stared at the Cultist, who, oblivious to all about him, faced the window, a look of wild elation on his face, droning to himself the while in singsong fashion.

"What's he saying?" whispered the columnist.

"He's quoting *Book of Revelations*, fifth chapter," replied Sheerin. Then, urgently, "Keep quiet and listen, I tell you."

The Cultist's voice had risen in a sudden increase of fervor: " 'And it came to pass that in those days the Sun, Beta, held lone vigil in the sky for ever longer periods as the revolutions passed; until such time as for full half a revolution, it alone, shrunken and cold, shone down upon Lagash.

" 'And men did assemble in the public squares and in the highways, there to debate and to marvel at the sight, for a strange depression had seized them. Their minds were troubled and their speech confused, for the souls of men awaited the coming of the Stars.

" 'And in the city of Trigon, at high noon, Vendret 2 came forth and said unto the men of Trigon, "Lo, ye sinners! Though ye scorn the ways of righteousness, yet will the time of reckoning come. Even now the Cave approaches to swallow Lagash; yea, and all it contains.

" 'And even as he spoke the lip of the Cave of Darkness passed the edge of Beta so that to all Lagash it was hidden from sight. Loud were the cries of men as it vanished, and great the fear of soul that fell upon them.

" 'It came to pass that the Darkness of the Cave fell upon Lagash, and there was no light on all the surface of Lagash. Men were even as blinded, nor could one man see his neighbor, though he felt his breath upon his face.

" 'And in this blackness there appeared the Stars, in countless numbers, and to the strains of music of such beauty that the very leaves of the trees cried out in wonder.

" 'And in that moment the souls of men departed from them, and their abandoned bodies became even as beasts; yea, even as brutes of the wild; so that through the blackened streets of the cities of Lagash they prowled with wild cries.

" 'From the Stars there then reached down the Heavenly Flame, and where it touched, the cities of Lagash flamed to utter destruction, so that of man and of the works of man nought remained.

" 'Even then—' "

There was a subtle change in Latimer's tone. His eyes had not shifted, but somehow he had become aware of the absorbed attention of the other two. Easily, without pausing for breath, the timbre of his voice shifted and the syllables became more liquid.

Theremon, caught by surprise, stared.

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The words seemed on the border of familiarity. There was an elusive shift in the accent, a tiny change in the vowel stress; nothing more—yet Latimer had become thoroughly unintelligible.

Sheerin smiled slyly. "He shifted to some old-cycle tongue, probably their traditional second cycle. That was the language in which the *Book of Revelations* was originally written, you know."

"It doesn't matter; I've heard enough." Theremon shoved his chair back and brushed his hair back with hands that no longer shook. "I feel much better now."

"You do?" Sheerin seemed mildly surprised.

"I'll say I do. I had a bad case of jitters just a while back. Listening to you and your gravitation and seeing that eclipse start almost finished me. But this"—he jerked a contemptuous thumb at the yellow-bearded Cultist—"*this* is the sort of thing my nurse used to tell me. I've been laughing at that sort of thing all my life. I'm not going to let it scare me *now*."

He drew a deep breath and said with a hectic gaiety, "But if I expect to keep on the good side of myself, I'm going to turn my chair away from the window."

Sheerin said, "Yes, but you'd better talk lower. Aton just lifted his head out of that box he's got it stuck into and gave you a look that should have killed you."

Theremon made a mouth. "I forgot about the old fellow." With elaborate care he turned the chair from the window, cast one distasteful look over his shoulder, and said, "It has occurred to me that there must be considerable immunity against this Star madness."

The psychologist did not answer immediately. Beta was past its zenith now, and the square of bloody sunlight that outlined the window upon the floor had lifted into Sheerin's lap. He stared at its dusky color thoughtfully and then bent and squinted into the sun itself.

The chip in its side had grown to a black encroachment that covered a third of Beta. He shuddered, and when he straightened once more his florid cheeks did not contain quite as much color as they had had previously.

With a smile that was almost apologetic, he reversed his chair also. "There are probably two million people in Saro City that are all trying to join the Cult at once in one gigantic revival." Then, ironically, "The Cult is in for an hour of unexampled prosperity. I trust they'll make the most of it. Now, what was it you said?"

"Just this. How did the Cultists manage to keep the *Book of Revelations* going from cycle to cycle, and how on Lagash did it get written in the first place? There must have been some sort of immunity, for if everyone had gone mad, who would be left to write the book?"

Sheerin stared at his questioner ruefully. "Well, now, young man, there isn't any eyewitness anwer to that, but we've got a few damned good notions as to what happened. You see, there are three kinds of people who might remain relatively unaffected. First, the very few who don't see the Stars at all: the seriously retarded or those who drink themselves into a stupor at the beginning of the eclipse and remain so to the end.

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We leave them out—because they aren't really witnesses.

"Then there are children below six, to whom the world as a whole is too new and strange for them to be too frightened at Stars and Darkness. They would be just another item in an already surprising world. You see that, don't you?"

The other nodded doubtfully. "I suppose so."

"Lastly, there are those whose minds are too coarsely grained to be entirely toppled. The very insensitive would be scarcely affected—oh, such people as some of our older, work-broken peasants. Well, the children would have fugitive memories, and that, combined with the confused, incoherent babblings of the half-mad morons, formed the basis for the *Book of Revelations*.

"Naturally, the book was based, in the first place, on the testimony of those least qualified to serve as historians; that is, children and morons; and was probably edited and reedited through the cycles."

"Do you suppose," broke in Theremon, "that they carried the book through the cycles the way we're planning on handing on the secret of gravitation?"

Sheerin shrugged. "Perhaps, but their exact method is unimportant. They do it, somehow. The point I was getting at was that the book can't help but be a mass of distortion, even if it is based on fact. For instance, do you remember the experiment with the holes in the roof that Faro and Yimot tried—the one that didn't work?"

"Yes."

"You know why it didn't w—" He stopped and rose in alarm, for Aton was approaching his face a twisted mask of consternation. "*What's happened?*"

Aton drew him aside and Sheerin could feel the fingers on his elbow twitching.

"Not so loud!" Aton's voice was low and tortured. "I've just gotten word from the Hideout on the private line."

Sheerin broke in anxiously. "They are in trouble?"

"Not *they*." Aton stressed the pronoun significantly. "They sealed themselves off just a while ago, and they're going to stay buried till day after tomorrow. They're safe. But the *city*, Sheerin—it's a shambles. You have no idea—" He was having difficulty in speaking.

"Well?" snapped Sheerin impatiently. "What of it? It will get worse. What are you shaking about?" Then, suspiciously, "How do you feel?"

Aton's eyes sparked angrily at the insinuation, and then faded to anxiety once more. "You don't understand. The Cultists are active. They're rousing the people to storm the Observatory —promising them immediate entrance into grace, promising them salvation, promising them anything. What are we to do, Sheerin?"

Sheerin's head bent, and he stared in long abstraction at his toes. He tapped his chin with one knuckle, then looked up and said crisply, "Do? What is there to do? Nothing at all. Do the men know of this?"

"No, of course not!"

"Not quite an hour."

"There's nothing to do but gamble. It will take time to organize any really formidable mob, and it will take more

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time to get them out here. We're a good five miles from the city—"

He glared out the window, down the slopes to where the farmed patches gave way to clumps of white houses in the suburbs; down to where the metropolis itself was a blur on the horizon—a mist in the waning blaze of Beta.

He repeated without turning, "It will take time. Keep on working and pray that totality comes first."

Beta was cut in half, the line of division pushing a slight concavity into the still-bright portion of the Sun. It was like a gigantic eyelid shutting slantwise over the light of a world.

The faint clatter of the room in which he stood faded into oblivion, and he sensed only the thick silence of the fields outside. The very insects seemed frightened mute. And things were dim.

He jumped at the voice in his ear. Theremon said, "Is something wrong?"

"Eh? Er—no. Get back to the chair. We're in the way." They slipped back to their corner, but the psychologist did not speak for a time. He lifted a finger and loosened his collar. He twisted his neck back and forth but found no relief. He looked up suddenly.

"Are you having any difficulty in breathing?"

The newspaperman opened his eyes wide and drew two or three long breaths. "No. Why?"

"I looked out the window too long, I suppose. The dimness got me. Difficulty in breathing is one of the first symptoms of a claustrophobic attack."

Theremon drew another long breath. "Well, it hasn't got me yet. Say, here's another of the fellows."

Beenay had interposed his bulk between the light and the pair in the corner, and Sheerin squinted up at him anxiously. "Hello, Beenay."

The astronomer shifted his weight to the other foot and smiled feebly. "You won't mind if I sit down awhile and join in the talk? My cameras are set, and there's nothing to do till totality." He paused and eyed the Cultist, who fifteen minutes earlier had drawn a small, skin-bound book from his sleeve and had been poring intently over it ever since. "That rat hasn't been making trouble, has he?"

Sheerin shook his head. His shoulders were thrown back and he frowned his concentration as he forced himself to breathe regularly. He said, "Have you had any trouble breathing, Beenay?"

Beenay sniffed the air in his turn. "It doesn't seem stuffy to me."

"A touch of claustrophobia," explained Sheerin apologetically.

"Ohhh! It worked itself differently with me. I get the impression that my eyes are going back on me. Things seem to blur and—well, nothing is clear. And it's cold, too."

"Oh, it's cold, all right. That's no illusion." Theremon grimaced. "My toes feel as if I've been shipping them cross-country in a refrigerating car."

"What we need," put in Sheerin, "is to keep our minds busy with extraneous affairs. I was telling you a while ago, Theremon, why Faro's experiments with the holes in the roof came to nothing."

"You were just beginning," replied Theremon. He encircled a knee with both arms and nuzzled his chin against it.

"Well, as I started to say, they were

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misled by taking the *Book of Revelations* literally. There probably wasn't any sense in attaching any physical significance to the Stars. It might be, you know, that in the presence of total Darkness, the mind finds it absolutely necessary to create light. This illusion of light might be all the Stars there really are."

"In other words," interposed Theremon, "you mean the Stars are the results of the madness and not one of the causes. Then, what good will Beenay's photographs be?"

"To prove that it is an illusion, maybe; or to prove the opposite; for all I know. Then again—"

But Beenay had drawn his chair closer, and there was an expression of sudden enthusiasm on his face. "Say, I'm glad you two got onto this subject." His eyes narrowed and he lifted one finger. "I've been thinking about these Stars and I've got a really cute notion. Of course it's strictly ocean foam, and I'm not trying to advance it seriously, but I think it's interesting. Do you want to hear it?"

He seemed half reluctant, but Sheerin leaned back and said, "Go ahead! I'm listening."

"Well, then, supposing there were other suns in the universe." He broke off a little bashfully. "I mean suns that are so far away that they're too dim to see. It sounds as if I've been reading some of that fantastic fiction, I suppose."

"Not necessarily. Still, isn't that possibility eliminated by the fact that, according to the Law of Gravitation, they would make themselves evident by their attractive forces?"

"Not if they were far enough off," rejoined Beenay, "really far off—maybe as much as four light years, or even more. We'd never be able to detect perturbations then, because they'd be too small. Say that there were a lot of suns that far off; a dozen or two, maybe."

Theremon whistled melodiously. "What an idea for a good Sunday supplement article. Two dozen suns in a universe eight light years across. Wow! That would shrink our world into insignificance. The readers would eat it up."

"Only an idea," said Beenay with a grin, "but you see the point. During an eclipse, these dozen suns would become visible because there'd be no *real* sunlight to drown them out. Since they're so far off, they'd appear small, like so many little marbles. Of course the Cultists talk of millions of Stars, but that's probably exaggeration. There just isn't any place in the universe you could put a million suns—unless they touch one another."

Sheerin had listened with gradually increasing interest. "You've hit something there, Beenay. And exaggeration is just exactly what would happen. Our minds, as you probably know, can't grasp directly any number higher than five; above that there is only the concept of 'many.' A dozen would become a million just like that. A damn good idea!"

"And I've got another cute little notion," Beenay said. "Have you ever thought what a simple problem gravitation would be if only you had a sufficiently simple system? Supposing you had a universe in which there was a planet with only one sun. The planet would travel in a perfect ellipse and the

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exact nature of the gravitational force would be so evident it could be accepted as an axiom. Astronomers on such a world would start off with gravity probably before they even invented the telescope. Naked-eye observation would be enough."

"But would such a system be dynamically stable?" questioned Sheerin doubtfully.

"Sure! They call it the 'one-and-one' case. It's been worked out mathematically, but it's the philosophical implications that interest me."

"It's nice to think about," admitted Sheerin, "as a pretty abstraction—like a perfect gas, or absolute zero."

"Of course," continued Beenay, "there's the catch that life would be impossible on such a planet. It wouldn't get enough heat and light, and if it rotated there would be total Darkness half of each day. You couldn't expect life—which is fundamentally dependent upon light—to develop under those conditions. Besides—"

Sheerin's chair went over backward as he sprang to his feet in a rude interruption. "Aton's brought out the lights."

Beenay said, "Huh," turned to stare, and then grinned halfway around his head in open relief.

There were half a dozen foot-long, inch-thick rods cradled in Aton's arms. He glared over them at the assembled staff members.

"Get back to work, all of you. Sheerin, come here and help me!"

Sheerin trotted to the older man's side and, one by one, in utter silence, the two adjusted the rods in makeshift metal holders suspended from the walls.

With the air of one carrying through the most sacred item of a religious ritual, Sheerin scraped a large, clumsy match into spluttering life and passed it to Aton, who carried the flame to the upper end of one of the rods.

It hesitated there awhile, playing futilely about the tip, until a sudden, crackling flare cast Aton's lined face into yellow highlights. He withdrew the match and a spontaneous cheer rattled the window.

The rod was topped by six inches of wavering flame! Methodically, the other rods were lighted, until six independent fires turned the rear of the room yellow.

The light was dim, dimmer even than the tenuous sunlight. The flames reeled crazily, giving birth to drunken, swaying shadows. The torches smoked devilishly and smelled like a bad day in the kitchen. But they emitted yellow light.

There was something about yellow light, after four hours of somber, dimming Beta. Even Latimer had lifted his eyes from his book and stared in wonder.

Sheerin warmed his hands at the nearest, regardless of the soot that gathered upon them in a fine, gray powder, and muttered ecstatically to himself. "Beautiful! Beautiful! I never realized before what a wonderful color yellow is."

But Theremon regarded the torches suspiciously. He wrinkled his nose at the rancid odor and said, "What are those things?"

"Wood," said Sheerin shortly.

"Oh, no, they're not. They aren't burning. The top inch is charred and the flame just keeps shooting up out of nothing."

"That's the beauty of it. This is a really efficient artificial-light mecha-

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nism. We made a few hundred of them, but most went to the Hideout, of course. You see''—he turned and wiped his blackened hands upon his handkerchief—''you take the pithy core of coarse water reeds, dry them thoroughly, and soak them in animal grease. Then you set fire to it and the grease burns, little by little. These torches will burn for almost half an hour without stopping. Ingenious, isn't it? It was developed by one of our own young men at Saro University.''

After the momentary sensation, the dome had quieted. Latimer had carried his chair directly beneath a torch and continued reading, lips moving in the monotonous recital of invocations to the Stars. Beenay had drifted away to his cameras once more, and Theremon seized the opportunity to add to his notes on the article he was going to write for the Saro City *Chronicle* the next day—a procedure he had been following for the last two hours in a perfectly methodical, perfectly conscientious and, as he was well aware, perfectly meaningless fashion.

But, as the gleam of amusement in Sheerin's eyes indicated, careful note-taking occupied his mind with something other than the fact that the sky was gradually turning a horrible deep purple-red, as if it were one gigantic, freshly peeled beet; and so it fulfilled its purpose.

The air grew, somehow, denser. Dusk, like a palpable entity, entered the room, and the dancing circle of yellow light about the torches etched itself into ever-sharper distinction against the gathering grayness beyond. There was the odor of smoke and the presence of little chuckling sounds that the torches made as they burned; the soft pad of one of the men circling the table at which he worked, on hesitant tiptoes; the occasional indrawn breath of someone trying to retain composure in a world that was retreating into the shadow.

It was Theremon who first heard the extraneous noise. It was a vague, unorganized *impression* of sound that would have gone unnoticed but for the dead silence that prevailed within the dome.

The newsman sat upright and replaced his notebook. He held his breath and listened; then, with considerable reluctance, threaded his way between the solarscope and one of Beenay's cameras and stood before the window.

The silence ripped to fragments at his startled shout: ''*Sheerin!*''

Work stopped! The psychologist was at his side in a moment. Aton joined him. Even Yimot 70, high in his little lean-back seat at the eyepiece of the gigantic solarscope, paused and looked downward.

Outside, Beta was a mere smoldering splinter, taking one last desperate look at Lagash. The eastern horizon, in the direction of the city, was lost in Darkness, and the road from Saro to the Observatory was a dull-red line bordered on both sides by wooded tracts, the trees of which had somehow lost individuality and merged into a continuous shadowy mass.

But it was the highway itself that held attention, for along it there surged another, and infinitely menacing, shadowy mass.

Aton cried in a cracked voice, ''The madmen from the city! They've come!''

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"How long to totality?" demanded Sheerin.

"Fifteen minutes, but . . . but they'll be here in five."

"Never mind, keep the men working. We'll hold them off. This place is built like a fortress. Aton, keep an eye on our young Cultist just for luck. Theremon, come with me."

Sheerin was out the door, and Theremon was at his heels. The stairs stretched below them in tight, circular sweeps about the central shaft, fading into a dank and dreary grayness.

The first momentum of their run had carried them fifty feet down, so that the dim, flickering yellow from the open door of the dome had disappeared and both above and below the same dusky shadow crushed in upon them.

Sheerin paused, and his pudgy hand clutched at his chest. His eyes bulged and his voice was a dry cough. "I can't . . . breathe. . . . Go down . . . yourself. Close all doors—"

Theremon took a few downward steps, then turned. "Wait! Can you hold out a minute?" He was panting himself. The air passed in and out his lungs like so much molasses, and there was a little germ of screeching panic in his mind at the thought of making his way into the mysterious Darkness below by himself.

Theremon, after all, was afraid of the dark!

"Stay here," he said. "I'll be back in a second." He dashed upward two steps at a time, heart pounding—not altogether from the exertion—tumbled into the dome and snatched a torch from its holder. It was foul-smelling, and the smoke smarted his eyes almost blind, but he clutched that torch as if he wanted to kiss it for joy, and its flame streamed backward as he hurtled down the stairs again.

Sheerin opened his eyes and moaned as Theremon bent over him. Theremon shook him roughly. "All right, get a hold on yourself. We've got light."

He held the torch at tiptoe height and, propping the tottering psychologist by an elbow, made his way downward in the middle of the protecting circle of illumination.

The offices on the ground floor still possessed what light there was, and Theremon felt the horror about him relax.

"Here," he said brusquely, and passed the torch to Sheerin. "You can hear *them* outside."

And they could. Little scraps of hoarse, wordless shouts.

But Sheerin was right; the Observatory was built like a fortress. Erected in the last century, when the neo-Gavottian style of architecture was at its ugly height, it had been designed for stability and durability rather than for beauty.

The windows were protected by the grillwork of inch-thick iron bars sunk deep into the concrete sills. The walls were solid masonry that an earthquake couldn't have touched, and the main door was a huge oaken slab reinforced with iron. Theremon shot the bolts and they slid shut with a dull clang.

At the other end of the corridor, Sheerin cursed weakly. He pointed to the lock of the back door which had been neatly jimmied into uselessness.

"That must be how Latimer got in," he said.

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"Well, don't stand there," cried Theremon impatiently. "Help drag up the furniture—and keep that torch out of my eyes. The smoke's killing me."

He slammed the heavy table up against the door as he spoke, and in two minutes had built a barricade which made up for what it lacked in beauty and symmetry by the sheer inertia of its massiveness.

Somewhere, dimly, far off, they could hear the battering of naked fists upon the door; and the screams and yells from outside had a sort of half reality.

That mob had set off from Saro City with only two things in mind: the attainment of Cultist salvation by the destruction of the Observatory, and a maddening fear that all but paralyzed them. There was no time to think of ground cars, or of weapons, or of leadership, or even of organization. They made for the Observatory on foot and assaulted it with bare hands.

And now that they were there, the last flash of Beta, the last ruby-red drop of flame, flickered feebly over a humanity that had left only stark, universal fear!

Theremon groaned, "Let's get back to the dome!"

In the dome, only Yimot, at the solarscope, had kept his place. The rest were clustered about the cameras, and Beenay was giving his instructions in a hoarse, strained voice.

"Get it straight, all of you. I'm snapping Beta just before totality and changing the plate. That will leave one of you to each camera. You all know about . . . about times of exposure—"

There was a breathless murmur of agreement.

Beenay passed a hand over his eyes. "Are the torches still burning? Never mind, I see them!" He was leaning hard against the back of a chair. "Now remember, don't . . . don't try to look for good shots. Don't waste time trying to get t-two stars at a time in the scope field. One is enough. And . . . and if you feel yourself going, *get away from the camera*."

At the door, Sheerin whispered to Theremon, "Take me to Aton. I don't see him."

The newsman did not answer immediately. The vague forms of the astronomers wavered and blurred, and the torches overhead had become only yellow splotches.

"It's dark," he whimpered.

Sheerin held out his hand. "Aton." He stumbled forward. "Aton!"

Theremon stepped after and seized his arm. "Wait, I'll take you." Somehow he made his way across the room. He closed his eyes against the Darkness and his mind against the chaos within it.

No one heard them or paid attention to them. Sheerin stumbled against the wall. "Aton!"

The psychologist felt shaking hands touching him, then withdrawing, a voice muttering, "Is that you, Sheerin?"

"Aton!" He strove to breathe normally. "Don't worry about the mob. The place will hold them off."

Latimer, the Cultist, rose to his feet, and his face twisted in desperation. His word was pledged, and to break it would mean placing his soul in mortal peril. Yet that word had been forced from him and had not been given freely. The Stars would come soon! He could not stand

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by and allow— And yet his word was pledged.

Beenay's face was dimly flushed as it looked upward at Beta's last ray, and Latimer, seeing him bend over his camera, made his decision. His nails cut the flesh of his palms as he tensed himself.

He staggered crazily as he started his rush. There was nothing before him but shadows; the very floor beneath his feet lacked substance. And then someone was upon him and he went down with clutching fingers at his throat.

He doubled his knee and drove it hard into his assailant. "Let me up or I'll kill you."

Theremon cried out sharply and muttered through a blinding haze of pain. "You double-crossing rat!"

The newsman seemed conscious of everything at once. He heard Beenay croak, "I've got it. At your cameras, men!" and then there was the strange awareness that the last thread of sunlight had thinned out and snapped.

Simultaneously he heard one last choking gasp from Beenay, and a queer little cry from Sheerin, a hystrical giggle that cut off in a rasp—and a sudden silence, a strange, deadly silence from outside.

And Latimer had gone limp in his loosening grasp. Theremon peered into the Cultist's eyes and saw the blankness of them, staring upward, mirroring the feeble yellow of the torches. He saw the bubble of froth upon Latimer's lips and heard the low animal whimper in Latimer's throat.

With the slow fascination of fear, he lifted himself on one arm and turned his eyes toward the blood-curdling blackness of the window.

Through it shone the Stars!

Not Earth's feeble thirty-six hundred Stars visible to the eye; Lagash was in the center of a giant cluster. Thirty thousand mighty suns shown down in a soul-searing splendor that was more frighteningly cold in its awful indifference than the bitter wind that shivered across the cold, horribly bleak world.

Theremon staggered to his feet, his throat constricting him to breathlessness, all the muscles of his body writhing in an intensity of terror and sheer fear beyond bearing. He was going mad and knew it, and somewhere deep inside a bit of sanity was screaming, struggling to fight off the hopeless flood of black terror. It was very horrible to go mad and know that you were going mad—to know that in a little minute you would be here physically and yet all the real essence would be dead and drowned in the black madness. For this was the Dark—the Dark and the Cold and the Doom. The bright walls of the universe were shattered and their awful black fragments were falling down to crush and squeeze and obliterate him.

He jostled someone crawling on hands and knees, but stumbled somehow over him. Hands groping at his tortured throat, he limped toward the flame of the torches that filled all his mad vision.

"Light!" he screamed.

Aton, somewhere, was crying, whimpering horribly like a terribly frightened child. "Stars—all the Stars—we didn't know at all. We didn't know anything. We thought six stars in a universe is something the Stars didn't notice is Darkness forever and ever and ever and the walls are breaking in and

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'we didn't know we couldn't know and anything—''

Someone clawed at the torch, and it fell and snuffed out. In the instant, the awful splendor of the indifferent Stars leaped nearer to them.

On the horizon outside the window, in the direction of Saro City, a crimson glow began growing, strengthening in brightness, that was not the glow of a sun.

The long night had come again. ■

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To be employed as a manager
in the Solar Spice and Liquors Company required
a certain failing. For business is,
in essence, the unending battle of economics.

POUL ANDERSON

Illustrated by Kelly Freas

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The cab obtained clearance from certain machines and landed on the roof of the Winged Cross. Emil Dalmady paid and stepped out. When it took off, he felt suddenly very alone. The garden was fragrant around him in a warm deep-blue summer's dusk; at this height, the sounds of Chicago Integrate were a murmur as of a distant ocean; the other towers and the skyways between them were a forest through which flitted will-o'-the-wisp aircars and beneath which—as if Earth had gone transparent—a fantastic galaxy of many-colored lights was blinking awake farther than the eye could reach. But the penthouse bulking ahead might have been a hill where a grizzly bear had its den.

The man squared his shoulders. *Haul in*, he told himself. *He won't eat you.* Anger lifted afresh. *I might just eat him.* He strode forward: a stocky, muscular figure in a blue zipskin, features broad and high of cheekbones, snubnosed, eyes green and slightly tilted, hair reddish black.

But despite stiffened will, the fact remained that he had not expected a personal interview with any merchant prince of the Polesotechnic League, and in one of the latter's own homes. When a live butler had admitted him, and he had crossed an improbably long stretch of trollcat rug to the Vie-Wall end of a luxury-cluttered living room, and was confronting Nicholas van Rijn, his throat tightened and his palms grew wet.

"Good evening," the host rumbled. "Welcome." His corpulent corpus did not rise from the lounger. Dalmady didn't mind. Not only bulk but height would have dwarfed him. Van Rijn waved a hand at a facing seat; the other gripped a liter tankard of beer. "Sit. Relax. You look quivery like a blancmange before a firing squad. What you drink, smoke, chew, sniff, or elsewise make amusements with?"

Dalmady lowered himself to an edge. Van Rijn's great hook-beaked, multichinned, moustached and goateed visage, framed in black shoulder-length ringlets, crinkled with a grin. Beneath the sloping brow, small jet eyes glittered at the newcomer. "Relax," he urged again. "Give the form-fitting a chance.

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Not so fun-making an embrace like a pretty girl, but less extracting, ha? I think maybe a little glass Genever and bitters over dry ice is a tranquilizator for you." He clapped.

"Sir," Dalmady said, harshly in his tension, "I don't want to seem ungracious, but—"

"But you came to Earth breathing flame and brimrocks, and went through six echelons of the toughest no-saying secretaries and officers what the Solar Spice and Liquors Company has got, like a bulldozer chasing a cowdozer, demanding to see whoever the crockhead was what fired you after what you done yonderways. Nobody had a chance to explain. Trouble was, they assumptioned you knew things what they take for granted. So natural, what they said sounded to you like a flushoff and you hurricaned your way from them to somebody else."

Van Rijn offered a cigar out of a gold humidor whose workmanship Dalmady couldn't identify except that it was nonhuman. The young man shook his head. The merchant selected one himself, bit off the end and spat that expertly into a receptor, and inhaled the tobacco to ignition. "Well," he continued, "somebody would have got through into you at last, only then I learned about you and ordered this meeting. I would have wanted to talk at you anyhows. Now I shall clarify everything like Hindu butter."

His geniality was well-nigh as overwhelming as his wrath would have been, assuming the legends about him were true. *And he could be setting me up for a thunderbolt*, Dalmady thought, and clung to his indignation as he answered:

"Sir, if your outfit is dissatisfied with my conduct on Suleiman, it might at least have told me why, rather than sending a curt message that I was being replaced and should report to HQ. Unless you can prove to me that I bungled, I will not accept demotion. It's a question of personal honor more than professional standing. They think that way where I come from. I'll quit. And . . . there are plenty of other companies in the League that will be glad to hire me."

"True, true, in spite of every candle I burn to St. Dismas." Van Rijn sighed through his cigar, engulfing Dalmady in smoke. "Always they try to pirate my executives what have not yet sworn fealty, like the thieves they are. And I, poor old lonely fat man, trying to run this enterprise personal what stretches across so many whole worlds, even with modern computer technology I get melted down from overwork, and too few men for helpers what is not total gruntbrains, and some of them got to be occupied just luring good executives away from elsewhere." He took a noisy gulp of beer. "Well."

"I suppose you've read my report, sir," was Dalmady's gambit.

"Today. So much information flowing from across the light-years, how can this weary old noggle hold it without data flowing back out like ear wax? Let me review to make sure I got it tesseract. Which means—ho, ho!—straight in four dimensions."

Van Rijn wallowed deeper into his lounger, bridged hairy fingers, and closed his eyes. The butler appeared with a huge steaming and hissing goblet. *If this is his idea of a small drink*—!

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Dalmady thought. Grimly, he forced himself to sit at ease and sip.

"Now." The cigar waggled in time to the words. "This star what its discoverer called Osman is out past Antares, on the far edge of present-day regular-basis League activities. One planet is inhabited, called by humans Suleiman. Subjovian; life based on hydrogen, ammonia, methane; primitive natives, but friendly. Turned out, on the biggest continent grows a plant we call . . . um-m-m . . . bluejack, what the natives use for a spice and tonic. Analysis showed a complicated blend of chemicals, answering sort of to hormonal stuffs for us, with synergistic effects. No good to oxygen breathers, but maybe we can sell to hydrogen breathers elsewhere.

"Well, we found very few markets, at least what had anythings to offer we wanted. You need a special biochemistry for bluejack to be beneficent. So synthesis would cost us more, counting investment and freight charges from chemical-lab centers, than direct harvesting by natives on Suleiman, paid for in trade goods. Given that, we could show a wee profit. Quite teensy—whole operation is near-as-damn marginal—but as long as things stayed peaceful, well, why not turn a few honest credits?

"And things were peaceful, too, for years. Natives cooperated fine, bringing in bluejack to warehouses. Outshipping was one of those milk runs where we don't knot up capital in our own vessels, we contract with a freighter line to make regular calls. Oh, *ja*, contretemps kept on countertiming—bad seasons, bandits raiding caravans, kings getting too greedy about taxes—usual stuffing, what any competent factor could handle on the spot, so no reports about it ever come to pester me.

"And then . . . Ahmed, more beer! . . . real trouble. Best market for bluejack is on a planet we call Babur. Its star, Mogul, lies in the same general region, about thirty light-years from Osman. Its top country been dealing with Technic civilization off and on for decades. Trying to modernize, they was mainly interested in robotics for some reason; but at last they did pile together enough outplanet exchange for they could commission a few hyperdrive ships built and crews trained. So now the Solar Commonwealth and other powers got to treat them with a little more respect; blast cannon and nuclear missiles sure improve manners, by damn! They is still small tomatoes, but ambitious. And to them, with the big domestic demand, bluejack is not an incidental thing."

Van Rijn leaned forward, wrinkling the embroidered robe that circled his paunch. "You wonder why I tell you what you know, ha?" he said. "When I need direct reports on a situation, especial from a world as scarcely known as Suleiman, I can't study each report from decades. Data retrieval got to make me an abstract. I check with you now, who was spotted there, whether the machine give me all what is significant to our talking. Has I been correct so far?"

"Yes," Dalmady said. "But—"

Yvonne Vaillancourt looked up from a console as the factor passed the open door of her collation lab. "What's wrong, Emil?" she asked. "I heard you

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clattering the whole way down the hall."

Dalmady stopped for a look. Clothing was usually at a minimum in the Earth-conditioned compound, but, while he had grown familiar with the skins of its inhabitants, he never tired of hers. Perhaps, he had thought, her blond shapeliness impressed him the more because he had been born and raised on Altai. The colonists of that chill planet went heavily dressed of necessity. The same need to survive forced austere habits on them; and, isolated in a largely unexplored frontier section, they received scant news about developments in the core civilization.

When you were one of half a dozen humans on a world whose very air was death to you—when you didn't even have visitors of your own species, because the ship that regularly called belonged to a Cynthian carrier—you had no choice but to live in free and easy style. Dalmady had had that explained to him while he was being trained for this post, and recognized it and went along with it. But he wondered if he would ever become accustomed to the *casualness* of the sophisticates whom he bossed.

"I don't know," he answered the girl. "The Thalassocrat wants me to the palace."

"Why, he knows perfectly well how to make a visi call."

"Yes, but a nomad's brought word of something nasty in the Uplands, and won't come near the set. Afraid it'll imprison his soul, I imagine."

"Hm-m-m, I think not. We're still trying to chart the basic Suleimanite psychology, you know, with only inadequate data from three or four cultures to go on . . . but they don't seem to have animistic tendencies like man's. Ceremony, yes, in abundance, but nothing we can properly identify as magic or religion."

Dalmady barked a nervous laugh. "Sometimes I think my whole staff considers our commerce an infernal nuisance that keeps getting in the way of their precious science."

"Sometimes you'd be right," Yvonne purred. "What'd hold us here except the chance to do research?"

"And how long would your research last if the company closed down this base?" he flared. "Which it will if we start losing money. My job's to see that we don't. I could use cooperation."

She slipped from her stool, came to him and kissed him lightly. Her hair smelled like remembered steppe grass warmed by an orange sun, rippling under the rings of Altai. "Don't we help?" she murmured. "I'm sorry, dear."

He bit his lip and stared past her, down the length of gaudy murals whose painting had beguiled much idle time over the years. "No, I'm sorry," he said with the stiff honesty of his folk. "Of course you're all loyal and— It's me. Here I am, the youngest among you, a half-barbarian herdboy, supposed to make a go of things . . . in one of the easiest, most routinized outposts in this sector . . . and after a bare fifteen months—"

If I fail, he thought, *well, I can return home, no doubt, and dismiss the sacrifices my parents made to send me to managerial school offplanet, scorn the luck that Solar Spice and Liquors had an opening here and no more experi-*

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enced employee to fill it, forget every dream about walking in times to come on new and unknown worlds that really call forth every resource a man has to give. Oh, yes, failure isn't fatal, except in subtler ways than I have words for.

"You fret too much." Yvonne patted his cheek. "Probably this is just another tempest in a chickenhouse. You'll bribe somebody, or arm somebody, or whatever's needful, and that will once again be that."

"I hope so. But the Thalassocrat acted—well, not being committed to xenological scholarly precision, I'd say he acted worried, too." Dalmady stood a few seconds longer, scowling, before: "all right, I'd better be on my way." He gave her a hug. "Thanks, Yvonne."

She watched him till he was out of sight, then returned to her work. Officially she was the trade post's secretary-treasurer, but such duties seldom came to her except when a freighter had landed. Otherwise she used the computers to try to find patterns in what fragments of knowledge her four colleagues could wrest from a world—an entire, infinitely varied world—and hoped that a few scientists elsewhere might eventually scan a report on Suleiman—one among thousands of planets—and be interested.

Airsuit donned, Dalmady left the compound by its main personnel lock. Wanting time to compose himself, he went afoot through the city to the palace—if they were city and palace.

He didn't know. Books, tapes, lectures, and neuroinductors had crammed him with information about this part of this continent; but those were the everyday facts and skills needed to manage operations. Long talks with his subordinates here had added a little insight, but only a little. Direct experience with the autochthons was occasionally enlightening, but just as apt to be confusing. No wonder that, once a satisfactory arrangement was made with Coast and Upland tribes (?), his predecessors had not attempted expansion or improvement. When you don't understand a machine, but it seems to be running reasonably smoothly, you don't tinker much.

Outside the compound's force field, local gravity dragged at him with forty percent greater pull than Earth's. Though this suit was light and his muscles hard, the air recycler necessarily included the extra mass of a unit for dealing with the hydrogen that seeped through any material. Soon he was sweating. Nevertheless it was as if the chill struck past all thermostatic coils, into his heavy bones.

High overhead stood Osman, a furious white spark, twice as luminous as Sol but, at its distance, casting a bare sixteenth of what Earth gets. Clouds, tinged red by organic compounds, drifted on slow winds through a murky sky where one of the three moons was dimly visible. That atmosphere bore thrice a terrestrial standard pressure. It was mostly hydrogen and helium, with vapors of methane and ammonia and traces of other gas. Greenhouse effect did not extend to unfreezing water.

Indeed, the planetary core was overlaid by a shell of ice, mixed with rock, penetrated by tilted metal-poor strata. The land glittered amidst its grayness and scrunched beneath Dalmady's boots.

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It sloped down to a dark, choppy sea of liquid ammonia whose horizon was too remote—given a 17,000-kilometer radius—for him to make out through the red-misted air.

Ice also were the buildings that rose blocky around him. They shimmered glasslike where doorways, or obscure carved symbols, did not break their smoothness. There were no streets in the usual sense, but aerial observation has disclosed an elaborate pattern in the layout of structures, about which the dwellers could not or would not speak. Wind moved ponderously between them. The air turned its sound, every sound, shrill.

Traffic surged. It was mainly pedestrian, natives on their business, carrying the oddly shaped tools and containers of a fireless neolithic nonhuman culture. A few wagons lumbered in with produce from the hinterland; their draught animals suggested miniature dinosaurs modeled by someone who had heard vague rumors of such creatures. A related, more slender species was ridden. Coracles bobbed across the sea; you might as well say the crews were fishing, though a true fish could live here unprotected no longer than a man.

Nothing reached Dalmady's earphones except the wind, the distant wave-rumble, the clop of feet and creak of wagons. Suleimanites did not talk casually. They did communicate, however, and without pause: by gesture, by ripple across erectile fur, by delicate exchanges between scent glands. They avoided coming near the human, but simply because his suit was hot to their touch. He gave and received many signals of greeting. After two years —twenty-five of Earth's—Coast and Uplands alike were becoming dependent on metal and plastic and energy-cell trade goods. Local labor had been eagerly available to help build a spaceport on the mesa overlooking town, and still did most of the work. That saved installing automatic machinery —one reason for the modest profit earned by this station.

Dalmady leaned into his uphill walk. After ten minutes he was at the palace.

The half-score natives posted outside the big, turreted building were not guards. While wars and robberies occurred on Suleiman, the slaying of a "king" seemed to be literally unthinkable. (An effect of pheromones? In every community the xenologists had observed thus far, the leader ate special foods which his followers insisted would poison anyone else; and maybe the followers were right.) The drums, plumed canes, and less identifiable gear which these beings carried were for ceremonial use.

Dalmady controlled his impatience and watched with a trace of pleasure the ritual of opening doors and conducting him to the royal presence. The Suleimanites were a graceful and handsome species. They were plantigrade bipeds, rather like men although the body was thicker and the average only came to his shoulder. The hands each bore two fingers between two thumbs, and were supplemented by a prehensile tail. The head was round, with a parrotlike beak, tympani for hearing, one large golden-hued eye in the middle and two smaller, less developed ones for binocular and peripheral vision. Clothing was gener-

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ally confined to a kind of sporran, elaborately patterned with symbols, to leave glands and mahogany fur available for signals. The fact that Suleimanite languages had so large a nonvocal component handicapped human efforts at understanding as much as anything else did.

The Thalassocrat addressed Dalmady by voice alone, in the blue-glimmering ice cavern of his audience room. Earphones reduced the upper frequencies to some the man could hear. Nonetheless, that squeak and gibber always rather spoiled the otherwise impressive effect of flower crown and carven staff. So did the dwarfs, hunchbacks, and cripples who squatted on rugs and skin-draped benches. It was not known why household servants were always recruited among the handicapped. Suleimanites had tried to explain when asked, but their meaning never came through.

"Fortune, power, and wisdom to you, Factor." They didn't use personal names on this world, and seemed unable to grasp the idea of an identification which was not a scent-symbol.

"May they continue to abide with you, Thalassocrat." The vocalizer on his back transformed Dalmady's version of local speech into sounds that his lips could not bring forth.

"We have here a Master of caravaneers," the monarch said.

Dalmady went through polite ritual with the Uplander, who was tall and rangy for a Suleimanite, armed with a stoneheaded tomahawk and a trade rifle designed for his planet, his barbarianism showing in gaudy jewels and bracelets. They were O.K., however, those hill country nomads. Once a bargain had been struck, they held to it with more literal-mindedness than humans could have managed.

"And what is the trouble for which I am summoned, Master? Has your caravan met bandits on its way to the Coast? I will be glad to equip a force for their suppression."

Not being used to talking with men, the chief went into full Suleimanite language—his own dialect, at that—and became incomprehensible. One of the midgets stumped forward. Dalmady recognized him. A bright mind dwelt in that poor little body, drank deep of whatever knowledge about the universe was offered, and in return had frequently helped with counsel or knowledge. "Let me ask him out, Factor and Thalassocrat," he suggested.

"If you will, Advisor," his overlord agreed.

"I will be in your debt, Translator," Dalmady said, with his best imitation of the prancing thanks-gesture.

Beneath the courtesies, his mind whirred and he found himself holding his breath while he waited. Surely the news couldn't be really catastrophic!

He reviewed the facts, as if hoping for some hitherto unnoticed salvation in them. With little axial tilt, Suleiman lacked seasons. Bluejack needed the cool, dry climate of the Uplands, but there it grew the year around. Primitive natives, hunters and gatherers, picked it in the course of their wanderings. Every several months, terrestrial, such a tribe would make rendezvous with one of the more advanced nomadic herding communities, who bartered for the parched leaves and fruits. A caravan would then form and make the long trip

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to this city, where Solar's folk would acquire the bales in exchange for Technic merchandise. You could count on a load arriving about twice a month. Four times in an Earthside year, the Cynthian vessel took away the contents of Solar's warehouse . . . and left a far more precious cargo of letters, tapes, journals, books, news from the stars that were so rarely seen in these gloomy heavens.

It wasn't the most efficient system imaginable, but it was the cheapest, once you calculated what the cost would be—in capital investment and civilized-labor salaries—of starting plantations. And costs must be kept low or the enterprise would change from a minor asset to a liabilty, which would soon be liquidated. As matters were, Suleiman was a typical outpost of its kind: to the scientists, a fascinating study and a chance to win reputation in their fields; to the factors, a comparatively easy job, a first step on a ladder at the top of which waited the big, glamorous, gorgeously paid managerial assignments.

Or thus it had been until now.

The Translator turned to Dalmady. "The Master says this," he piped. "Lately in the Uplands have come what he calls . . . no, I do not believe that can be said in words alone—It is clear to me, they are machines that move about harvesting the bluejack."

"What?" The man realized he had exclaimed in Anglic. Through suddenly loud pulses, he heard the Translator go on:

"The wild folk were terrified and fled those parts. The machines came and took what they had stored against their next rendezvous. That angered this Master's nomads, who deal there. They rode to protest. From afar they saw a vessel, like the great flying vessel that lands here, and a structure abuilding. Those who oversaw that work were . . . low, with many legs and claws for hands . . . long noses— A gathering robot came and shot lightning past the nomads. They saw they, too, must flee, lest its warning shot become deadly. The Master himself took a string of remounts and posted hither as swiftly as might be. In words, I cannot say more of what he has to tell."

Dalmady gasped into the frigid blueness that enclosed him. His mouth felt dry, his knees weak, his stomach in upheaval. "Baburites," he mumbled. "Got to be. But why're they doing this to us?"

Brush, herbage, leaves on the infrequent trees, were many shades of black. Here and there a patch of red, or brown, or blue flowering relieved it, or an ammonia river cataracting down the hills. Farther off, a range of ice mountains flashed blindingly; Suleiman's twelve-hour day was drawing to a close, and Osman's rays struck level through a break in roiling ruddy cloud cover. Elsewhere a storm lifted like a dark wall on which lightning scribbled. The dense atmosphere brought its thunder-noise to Dalmady as a high drumroll. He paid scant attention. The gusts that hooted around his car, the air pockets into which it lurched, made piloting a full-time job. A cybernated vehicle would have been too expensive for this niggardly rewarding planet.

"There!" cried the Master. He squatted with the Translator in an after com-

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partment, which was left under native conditions and possessed an observation dome. In deference to his superstitions, or whatever they were, only the audio part of the intercom was turned on.

"Indeed," the Translator said more calmly. "I descry it now. Somewhat to our right, Factor—in a valley by a lake . . . do you see?"

"A moment." Dalmady locked the altitude controls. The car would bounce around till his teeth rattled, but the grav field wouldn't let it crash. He leaned forward in his harness, tried to ignore the brutal pull on him, and adjusted the scanner screen. His race had not evolved to see at those wavelengths which penetrated this atmosphere best; and the distance was considerable, as distances tend to be on a subjovian.

Converting light frequencies, amplifying, magnifying, the screen flung a picture at him. Tall above shrubs and turbulent ammonia stood a spaceship. He identified it as a Holbert-X freighter, a type commonly sold to hydrogen breathers. There had doubtless been some modifications to suit its particular home world, but he saw none except a gun turret and a couple of missile tube housings.

A prefabricated steel and ferrocrete building was being assembled nearby. The construction robots must be working fast, without pause; the cube was already more than half finished. Dalmady glimpsed flares of energy torches, like tiny blue novas. He couldn't make out individual shapes, and didn't want to risk coming near enough.

"You see?" he asked the image of Peter Thorson, and transmitted the picture to another screen.

Back at the base, his engineer's massive head nodded. Behind could be seen the four remaining humans. They looked as strained and anxious as Dalmady felt, Yvonne perhaps more so.

"Yeh. Not much we can do about it," Thorson declared. "They pack bigger weapons. And see, in the corners of the barn, those bays? That's for blast cannon, I swear. Add a heavy-duty forcefield generator for passive defense, and it's a nut we can't hope to crack."

"The home office—"

"Yeh, they *might* elect to resent the invasion and dispatch a regular warcraft or three. But I don't believe it. Wouldn't pay, in economic terms. And it'd make every kind of hooraw, because remember, SSL hasn't got any legal monopoly here." Thorson shrugged. "My guess is, Old Nick'll simply close down on Suleiman, probably wangling a deal with the Baburites that'll cut his losses and figuring to diddle them good at a later date." He was a veteran mercantile professional, accustomed to occasional setbacks, indifferent to the scientific puzzles around him.

Yvonne, who was not, cried softly, "Oh, no! We can't! The insights we're gaining—"

And Dalmady, who could not afford a defeat this early in his career, clenched one fist and snapped, "We can at least talk to them, can't we? I'll try to raise them. Stand by." He switched the outercom to a universal band and set the Come In going. The last thing he had seen from the compound was her stricken eyes.

The Translator inquired from aft:

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"Do you know who the strangers are and what they intend, Factor?"

"I have no doubt they come from Babur, as we call it," the man replied absently. "That is a world"—the more enlightened Coast dwellers had acquired some knowledge of astronomy—"akin to yours. It is larger and warmer, with heavier air. Its folk could not endure this one for long without becoming sick. But they can move about unarmored for a while. They buy most of our bluejack. Evidently they have decided to go to the source."

"But why, Factor?"

"For profit, I suppose, Translator." *Maybe just in their nonhuman cost accounting. That's a giant investment they're making in a medicinal product. But they don't operate under capitalism, under anything that human history ever saw, or so I've heard. Therefore they may consider it an investment in . . . empire? No doubt they can expand their foothold here, once we're out of the way—*

The screen came to life.

The being that peered from it stood about waist high to a man in its erect torso. The rest of the body stretched behind in a vaguely caterpillar shape, on eight stumpy legs. Along that glabrous form was a row of opercula protecting tracheae which, in a dense hydrogen atmosphere, aerated the organism quite efficiently. Two arms ended in claws reminiscent of a lobster's; from the wrists below sprouted short, tough finger-tendrils. The head was dominated by a spongy snout. A Baburite had no mouth. It—individuals changed sex from time to time—macerated food with the claws and put it in a digestive pouch to be dissolved before the snout sucked it up. The eyes were four, and tiny. Speech was by diaphragms on either side of the skull, hearing and smell were associated with the tracheae. The skin was banded orange, blue, white, and black. Most of it was hidden by a gauzy robe.

The creature would have been an absurdity, a biological impossibility, on an Earth-type world. In its own ship, in strong gravity and thick cold air and murk through which shadowy forms moved, it had dignity and power.

It thrummed noises which a vocalizer rendered into fairly good League Latin: "We were expecting you. Do not approach closer."

Dalmady moistened his lips. He felt cruelly young and helpless. "G-g-greeting. I am the factor."

The Baburite made no comment.

After a while, Dalmady plowed on: "We have been told that you . . . well, you are seizing the bluejack territory. I cannot believe that is correct."

"It is not, precisely," said the flat mechanical tone. "For the nonce, the natives may use these lands as heretofore, except that they will not find much bluejack to harvest. Our robots are too effective. Observe."

The screen flashed over to a view of a squat, cylindrical machine. Propelled by a simple grav drive, it floated several centimeters off the ground. Its eight arms terminated in sensors, pluckers, trimmers, brush cutters. On its back was welded a large basket. On its top was a master transceiver and a swivel-mounted blaster.

"It runs off accumulators," the unseen Baburite stated. "These need only

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be recharged once in thirty-odd hours, at the fusion generator we are installing, unless a special energy expenditure occurs . . . like a battle, for instance. High-hovering relay units keep the robots in constant touch with each other and with a central computer, currently in the ship, later to be in the blockhouse. *It controls them all simultaneously*, greatly reducing the cost per unit." With no trace of sardonicism: "You will understand that such a beamcasting system cannot feasibly be jammed.The computer will be provided with missiles as well as guns and defensive fields. It is programmed to strike back at any attempt to hamper its operations."

The robot's image disappeared, the being's returned. Dalmady felt faint. "But that would . . . would be . . . an act of war!" he stuttered.

"No. It would be self-protection, legitimate under the rules of the Polesotechnic League. You may credit us with the intelligence to investigate the social as well as physical state of things before we acted and, indeed, to become an associate member of the League. No one will suffer except your company. That will not displease its competitors. They have assured our representatives that they can muster enough Council votes to prevent sanctions. It is not as if the loss were very great. Let us recommend to you personally that you seek employment elsewhere."

Uh-huh . . . after I dropped a planet . . . I might maybe get a job cleaning latrines some place, went through the back of Dalmady's head. "No," he protested, "what about the autochthons? They're hurting already."

"When the land has been cleared, bluejack plantations will be established," the Baburite said. "Doubtless work can be found for some of the displaced savages, if they are sufficiently docile. Doubtless other resources, ignored by you oxygen breathers, await exploitation. We may in the end breed colonists adapted to Suleiman. But that will be of no concern to the League. We have investigated the practical effect of its prohibition on imperialism by members. Where no one else is interested in a case, a treaty with a native government is considered sufficient, and native governments with helpful attitudes are not hard to set up. Suleiman is such a case. A written-off operation that was never much more than marginal, out on an extreme frontier, is not worth the League's worrying about."

"The principle—"

"True. We would not provoke war, nor even our own expulsion and a boycott. However, recall that you are not being ordered off this planet. You have simply met a superior competitor, superior by virtue of living closer to the scene, being better suited to the environment and far more interested in succeeding here. We have the same right to launch ventures as you."

"What do you mean, 'we'?" Dalmady whispered. "Who are you? What are you? A private company, or—"

"Nominally, we are so organized, though like many other League associates we make no secret of this being *pro forma*," the Baburite told him. "Actually, the terms on which our society must deal with the Technic aggregate have little relevance to the terms of its interior structure. Considering the dif-

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ferences—sociological, psychological, biological—between us and you and your close allies, our desire to be free of your civilization poses no real threat to the latter and hence will never provoke any real reaction. At the same time, we will never win the freedom of the stars without the resources of modern technology.

"To industrialize with minimum delay, we must obtain the initial capacity through purchases from the Technic worlds. This requires Technic currency. Thus, while we spend what appears to be a disproportionate amount of effort and goods on this bluejack project, it will result in saving outplanet exchange for much more important things.

"We tell you what we tell you in order to make clear, not only our harmlessness to the League as a whole, but our determination. We trust you have taped this discussion. It may prevent your employer from wasting our time and energy in counteracting any foredoomed attempts by him to recoup. While you remain on Suleiman, observe well. When you go back, report faithfully."

The screen blanked. Dalmady tried for minutes to make the connection again, but got no answer.

Thirty days later, which would have been fifteen of Earth's, a conference met in the compound. Around a table, in a room hazed and acrid with smoke, sat the humans. In a full-size screen were the images of the Thalassocrat and the Translator, a three-dimensional realism that seemed to breathe out the cold of the ice chamber where they crouched.

Dalmady ran a hand through his hair. "I'll summarize," he told them wearily. The Translator's fur began to move, his voice to make low whistles, as he rendered from the Anglic for his king. "The reports of our native scouts were waiting for me, recorded by Yvonne, when I returned from my own latest flit a couple of hours ago. Each datum confirms every other.

"We'd hoped, you recall, that the computer would be inadequate to cope with us, once the Baburite ship had left."

"Why should the live crew depart?" Sanjuro Nakamura asked.

"That's obvious," Thorson said. "They may not run their domestic economic the way we run ours, but that doesn't exempt them from the laws of economics. A planet like Babur —actually, a single dominant country on it, or whatever they have—still backward, still poor, has limits on what it can afford. They may enjoy shorter lines of communication than we do, but we, at home, enjoy a lot more productivity. At their present stage, they can't spend what it takes to create and maintain a permanent, live-staffed base like ours. Suleiman isn't too healthy for them, either, you know; and they lack even our small background of accumulated experience. So they've got to automate at first, and just send somebody once in a while to check up and collect the harvest."

"Besides," Alice Bergen pointed out, "the nomads are sworn to us. They wouldn't make a deal with another party. Not that the Baburites could use them profitably anyway. We're sitting in the only suitable depot area, the only one whose people have a culture that makes it easy to train them in service

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jobs for us. So the Baburites have to operate right on the spot where the bluejack grows. The nomads resent having their caravan trade ended, and would stage guerrilla attacks on live workers."

"*Whew!*" Nakamura said, with an attempted grin. "I assure you, my question was only rhetorical. I simply wanted to point out that the opposition would not have left everything in charge of a computer if they weren't confident the setup would function, including holding us at bay. I begin to see why their planners concentrated on developing robotics at the beginning of modernization. No doubt they intend to use machines in quite a few larcenous little undertakings."

"Do you know how many robots there are?" Isabel asked.

"We estimate a hundred," Dalmady told her, "though we can't get an accurate count. They operate fast, you see, covering a huge territory—in fact, the entire territory where bluejack grows thickly enough to be worth gathering—and they're identical in appearance except for the relay hoverers."

"That must be some computer, to juggle so many at once, over such varying conditions," Alice remarked. Cybernetics was not her field.

Yvonne shook her head; the gold tresses swirled. "Nothing extraordinary. We have long-range telephotos, taken during its installation. It's a standard multi-channel design, only the electronics modified for ambient conditions. Rudimentary awareness: more isn't required, and would be uneconomic to provide, when its task is basically simple."

"Can't we outwit it, then?" Alice asked.

Dalmady grimaced. "What do you think my native helpers and I have been trying to do thereabouts, this past week? It's open country; the relayers detect you coming a huge ways off, and the computer dispatches robots. Not many are needed. If you come too close to the blockhouse, they fire warning blasts. That's terrified the natives. Few of them will approach anywhere near, and in fact the savages are starting to evacuate, which'll present us with a nice bunch of hungry refugees. Not that I blame them. A low-temperature organism cooks easier than you or me. I did push ahead, and was fired on for real. I ran away before my armor should be pierced."

"What about airborne attack?" Isabel wondered.

Thorson snorted. "In three rattly cars, with handguns? Those robots fly, too, remember. Besides, the centrum has forcefields, blast cannon, missiles. A naval vessel would have trouble reducing it."

"Furthermore," interjected the Thalassocrat, "I am told of a threat to destroy this town by airborne weapons, should a serious assault be made on yonder place. That cannot be risked. Sooner would I order you to depart for aye, and strike what bargain I was able with your enemies."

He can make that stick, Dalmady thought, *by the simple process of telling our native workers to quit.*

Not that that would necessarily make any difference. He recalled the last statement of a nomad Master, as the retreat from a reconnaissance took place, Suleimanites on their animals, man on

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a gravscooter. "We have abided by our alliance with you, but you not by yours with us. Your predecessors swore we should have protection from skyborne invaders. If you fail to drive off these, how shall we trust you?" Dalmady had pleaded for time and had grudgingly been granted it, since the caravaneers did value their trade with him. *But if we don't solve this problem soon, I doubt the system can ever be renewed.*

"We shall not imperil you," he promised the Thalassocrat.

"How real is the threat?" Nakamura asked. "The League wouldn't take kindly to slaughter of harmless autochthons."

"But the League would not necessarily do more than complain," Thorson said, "especially if the Baburites argue that we forced them into it. They're banking on its indifference, and I suspect their judgment is shrewd."

"Right or wrong," Alice said, "their assessment of the psychopolitics will condition what they themselves do. And what assessment have they made? What do we know about their ways of thinking?"

"More than you might suppose," Yvonne replied. "After all, they've been in contact for generations, and you don't negotiate commercial agreements without having done some studies in depth first. The reason you've not seen much of me, these past days, is that I've buried myself in our files. We possess, right here, a bucketful of information about Babur."

Dalmady straightened in his chair. His pulse picked up the least bit. It was no surprise that a large and varied xenological library existed in this insignificant outback base. Microtapes were cheaply reproduced, and you never knew who might chance by or what might happen, so you were routinely supplied with references for your entire sector. "What do we have?" he barked.

Yvonne smiled wryly. "Nothing spectacular, I'm afraid. The usual: three or four of the principal languages, sketches of history and important contemporary cultures, state-of-technology analyses, statistics on stuff like population and productivity—besides the planetology, biology, psychoprofiling, et cetera. I tried and tried to find a weak point, but couldn't. Oh, I can show that this operation must be straining their resources, and will have to be abandoned if it doesn't quickly pay off. But that's just as true of us."

Thorson fumed on his pipe. "If we could fix a gadget— We have a reasonably well-equipped workshop. That's where I've been sweating, myself."

"What had you in mind?" Dalmady inquired. The dullness of the engineer's voice was echoed in his own.

"Well, at first I wondered about a robot to go out and hunt theirs down. I could build one, a single one, more heavily armed and armored." Thorson's hand flopped empty, palm up, on the table. "But the computer has a hundred; and it's more sophisticated by orders of magnitude than any brain I could cobble together from spare cybernetics parts; and as the Thalassocrat says, we can't risk a missile dropped on our spaceport in retaliation, because it'd take out most of the city.

"Afterward I thought about jamming, or about somehow lousing the

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computer itself, but that's totally hopeless. It'd never let you get near."

He sighed. "My friends, let's admit that we've had the course, and plan how to leave with minimum loss."

The Thalassocrat stayed imperturbable, as became a monarch. But the Translator's main eye filmed over, his tiny body shrank into itself, and he cried: "We had hoped . . . one year our descendants, learning from you, joining you among the uncounted suns—Is there instead to be endless rule by aliens?"

Dalmady and Yvonne exchanged looks. Their hands clapsed. He believed the same thought must be twisting in her: *We, being of the League, cannot pretend to altruism. But we are not monsters either. Some cold accountant in an office on Earth may order our departure. But can we who have been here, who like these people and were trusted by them, abandon them and continue to live with ourselves? Would we not forever feel that any blessings given us were stolen?*

And the old, old legend crashed into his awareness.

He sat for a minute or two, unconscious of the talk that growled and groaned around him. Yvonne first noticed the blankness in his gaze. "Emil," she murmured, "are you well?"

Dalmady sprang to his feet with a whoop.

"What in space?" Nakamura said.

The factor controlled himself. He trembled, and small chills ran back and forth along his nerves; but his words came steady. "I have an idea."

Above the robes that billowed around

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him in the wind, the Translator carried an inconspicuous miniature audiovisual two-way. Dalmady in the car which he had landed behind a hill some distance off, Thorson in the car which hovered to relay, Yvonne and Alice and Isabel and Nakamura and the Thalassocrat in the city, observed a bobbing, swaying landscape on their tuned-in screens. Black leaves streamed, long and ragged, on bushes whose twigs clicked an answer to the whining air; boulders and ice chunks humped among them; an ammonia fall boomed on the right, casting spray across the field of view. The men in the cars could likewise feel the planet's traction and the shudder of hulls under that slow, thick wind.

"I still think we should've waited for outside help," Thorson declared on a separate screen. "That rig's a real lashup."

"And I still say," Dalmady retorted, "your job's made you needlessly fussy in this particular case. Besides, the natives couldn't've been stalled much longer." *Furthermore, if we can rout them with nothing but what was on hand, that ought to shine in my record. I'd like to think that's less important to me, but I can't deny it's real.*

One way or another, the decision had to be mine. I am the factor.

It's a lonesome feeling. I wish Yvonne were here beside me.

"Quiet," he ordered. "Something's about to happen."

The Translator had crossed a ridge and was gravscooting down the opposite slope. He required no help at that; a few days of instruction had made him a very fair driver, even in costume. He was entering the robot-held area, and already

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a skyborne unit slanted to intercept him. In the keen Osman-light, against ocherous clouds, it gleamed like fire.

Dalmady crouched in his seat. He was airsuited. If his friend got into trouble, he'd slap down his faceplate, open the cockpit, and swoop to an attempted rescue. A blaster lay knobby in his lap. The thought he might come too late made a taste of sickness in his mouth.

The robot paused at hover, arms extended, weapon pointed. The Translator continued to glide at a steady rate. When near collision, the two-way spoke for him: "Stand aside. We are instituting a change of program."

Spoke, to the listening computer, in the principal language of Babur.

Yvonne had worked out the plausible phrases, and spent patient hours with vocalizer and recorder until they seemed right. Engineer Thorson, xenologists Nakamura and Alice Bergen, artistically inclined biologist Isabel da Fonseca, Dalmady himself and several Suleimanite advisors who had spied on the Baburites, had created the disguise. Largely muffled in cloth, it didn't have to be too elaborate—a torso shaven and painted; a simple mechanical caterpillar body behind, steered by the hidden tail, automatically pacing its six legs with the wearer's two; a flexible mask with piezoelectric controls guided by the facial muscles beneath; claws and tendrils built over the natural arms, fake feet over the pair of real ones.

A human, or an ordinary Suleimanite, could not successfully have worn such an outfit. If nothing else, they were too big. But presumably it had not occurred to the Baburites to allow for midgets existing on this planet. The disguise was far from perfect; but presumably the computer was not programmed to check for any such contingency; furthermore, an intelligent, well-rehearsed actor, adapting his role moment by moment as no robot ever can, creates a gestalt transcending any minor errors of detail.

And . . . logically, the computer *must* be programmed to allow Baburites into its presence, to service it and collect the bluejack stored nearby.

Nonetheless, Dalmady's jaws ached from the tension on them.

The robot shifted out of the viewfield. In the receiving screens, ground continued to glide away underneath the scooter.

Dalmady switched off audio transmission from base. Though none save Yvonne, alone in a special room, was now sending to the Translator, and she via a bone conduction receiver—still, the cheers that had filled the car struck him as premature.

But the kilometers passed and passed. And the blockhouse hove in view, dark, cubical, bristling with sensors and antennae, cornered with the sinister shapes of gun emplacements and missile silos. No forcefield went up. Yvonne said through the Translator's unit: "Open; do not close again until told," and the idiot-savant computer directed a massive gate to swing wide.

What happened beyond was likewise Yvonne's job. She scanned through the portal by the two-way, summoned what she had learned of Baburite automation technology, and directed the Translator. Afterward she said it hadn't been difficult except for poor visibility; the builders had used standard layouts and programming languages. But to the factor it was an hour of sweating, cursing,

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pushing fingers and belly muscles against each other, staring and staring at the image of enigmatic units which loomed between blank walls, under bluish light that was at once harsh and wan.

When the Translator emerged and the gate closed behind him, Dalmady almost collapsed.

Afterward, though—well, League people were pretty good at throwing a celebration!

"Yes," Dalmady said. "But—"

"Butter me no buts," van Rijn said. "Fact is, you reset that expensive computer so it should make those expensive robots stand idle. Why not leastwise use them for Solar?"

"That would have ruined relations with the natives, sir. Primitives don't take blandly to the notion of technological unemployment. So scientific studies would have become impossible. How then would you attract personnel?"

"What personnel would we need?"

"Some on the spot, constantly. Otherwise the Baburites, close as they are, could come back and, for example, organize and arm justly disgruntled Suleimanites against us. Robots or no, we'd soon find the bluejack costing us more than it earned us . . . Besides, machines wear out and it costs to replace them. Live native help will reproduce for nothing."

"Well, you got that much sense, anyhows," van Rijn rumbled. "But why did you tell the computer it and its robots should attack *any* kind of machine, like a car or spacecraft, what comes near, and anybody of any shape what tells it to let him in? Supposing situations change, our people can't do nothings with it now neither."

"I told you, they don't need to," Dalmady rasped. "We get along—not dazzlingly, but we get along, we show a profit—with our traditional arrangements. As long as we maintain those, we exclude the Baburites from them. If we ourselves had access to the computer, we'd have to mount an expensive guard over it. Otherwise the Baburites could probably pull a similar trick on us, right? As is, the system interdicts any attempt to modernize operations in the bluejack area. Which is to say, it protects our monopoly—free—and will protect it for years to come."

He started to rise. "Sir," he continued bitterly, "the whole thing strikes me as involving the most elementary economic calculations. Maybe you have something subtler in mind, but if you do—"

"Whoa!" van Rijn boomed. "Squat yourself. Reel in some more of your drink, boy, and listen at me. Old and fat I am, but lungs and tongue I got. Also in working order is two other organs, one what don't concern you but one which is my brain, and my brain wants I should get information from you and stuff it."

Dalmady found he had obeyed.

"You need to see past a narrow specialism," van Rijn said. "Sometimes a man is too stupid good at his one job. He booms it, no matter the consequentials to everything else, and makes trouble for the whole organization he is supposed to serve. Like, you considered how Babur would react?"

"Of course. Freelady Vaillancourt—" *When will I be with her again?*—"and

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Drs. Bergen and Nakamura in particular, did an exhaustive analysis of materials on hand. As a result, we gave the computer an additional directive: that it warn any approaching vehicle before opening fire. The conversation I had later, with the spaceship captain, or whatever he was, bore out our prediction."

(A quivering snout. A bleak gleam in four minikin eyes. But the voice, strained through a machine, emotionless: "Under the rules your civilization has devised, you have not given us cause for war; and the League always responds to what it considers unprovoked attack. Accordingly, we shall not bombard.")

"No doubt they feel their equivalent of fury," Dalmady said. "But what can they do? They're realists. Unless they think of some new stunt, they'll write Suleiman off and try elsewhere."

"And they buy our bluejack yet?"

"Yes."

"We should maybe lift the price, like teaching them a lesson they shouldn't make fumblydiddles with us?"

"You can do that, if you want to make them decide they'd rather synthesize the stuff. My report recommends against it."

This time Dalmady did rise. "Sir," he declared in anger, "I may be a yokel, my professional training may have been in a jerkwater college, but I'm not a congenital idiot who's mislaid his pills and I do take my pride seriously. I made the best decision I was able on Suleiman. You haven't tried to show me where I went wrong, you've simply had me dismissed from my post, and tonight you drone about issues that anybody would understand who's graduated from diapers. Let's not waste more of our time. Good evening."

Van Rijn avalanched upward to his own feet. "Ho, ho!" he bawled. "Spirit, too! I like, I like!"

Dumfounded, Dalmady could only gape.

Van Rijn clapped him on the shoulder, nearly felling him. "Boy," the merchant said, "I didn't mean to rub your nose in nothings except sweet violets. I did have to know, did you stumble onto your answer, which is beautiful, or can you think original? Because you take my saying, maybe everybody understands like you what is not wearing diapers no more; but if that is true, why, ninety-nine point nine nine percent of every sophont race is wearing diapers, at least on their brains, and it leaks out of their mouths. I find you is in the oh point oh one percent, and I want you. Hoo-ha, how I want you!"

He thrust the gin-filled goblet back into Dalmady's hand. His tankard clanked against it. "Drink! Drink!"

Dalmady took a sip. Van Rijn began to prowl.

"You is from a frontier planet and so is naïve," the merchant said, "but that can be outlived like pimples. See, when my underlings at HQ learned you had pulled our nuts from the fire on Suleiman, they sent you a standard message, not realizing an Altaian like you would not know that in such cases the proceeding is SOP," which he pronounced "sop." He waved a gorilla arm, splashing beer on the floor. "Like I say, we had to check if you was lucky only. If so, we would promote you to

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be manager some place better and forget about you. But if you was, actual, extra smart and tough, we don't want you for a manager. You is too rare and precious for that. Would be like using a Hokusai print in a catbox."

Dalmady raised goblet to mouth, unsteadily. "What do you mean?" he croaked.

"Entrepreneur! You will keep title of factor, because we can't make jealousies, but what you do is what the old Americans would have called a horse of a different dollar.

"Look." Van Rijn reclaimed his cigar from the disposal rim, took a puff, and made forensic gestures with it and tankard alike while he continued his earthquake pacing. "Suleiman was supposed to be a nice routine post, but you told me how little we know on it and how sudden the devil himself came to lunch. Well, what about the real new, real hairy—and real fortunemaking—places? Ha?

"You don't want a manager for them, not till they been whipped into shape. A good manager is a very high-powered man, and we need a lot of him. But in his bottom, he is a routineer; his aim is to make things go smooth. No, for the wild places you need an innovator in charge, a man what likes to take risks, a heterodoxy if she is female—somebody what can meet wholly new problems in unholy new ways—you see?

"Only such is rare. I tell you. They command high prices: high as they can earn for themselves. Natural, I want them earning for me, too. So I don't put that kind of factor on salary and dangle a promotion ladder in front of him. No, the entrepreneur kind, first I get his John Bullcock on a ten-year oath of fealty. Next I turn him loose with a stake and my backup, to do what he wants, on straight commission of ninety percent.

"Too bad nobody typed you before you went in managerial school. Now you must have a while in an entrepreneurial school I got tucked away where nobody notices. Not dull for you; I hear they throw fine orgies; but mainly I think you will enjoy your classes, if you don't mind working till brain-sweat runs out your nose. Afterward you go get rich, if you survive, and have a big ball of fun even if you don't. Hokay?"

Dalmady thought for an instant of Yvonne; and then he thought, *What the deuce, if nothing better develops, in a few years I can set any hiring policies I feel like*; and: "Hokay!" he exclaimed, and tossed off his drink in a single gulp. ■

●Good ideas are not adopted automatically. They must be driven into practice with courageous impatience.

Adm. Hyman G. Rickover

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LETTER TO A PHOENIX

The Phoenix had one way to immortality—a painful way. No man, as an individual, is immortal, yet we are immortal through descendants. But races? They're strictly mortal—

BY FREDRIC BROWN

Illustrated by Orban

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There is much to tell you, so much that it is difficult to know where to begin. Fortunately, I have forgotten most of the things that have happened to me. Fortunately, the mind has a limited capacity for remembering. It would be horrible if I remembered the details of a hundred and eighty thousand years—the details of four thousand lifetimes that I have lived since the first great atomic war.

Not that I have forgotten the really great moments. I remember being on the first expedition to land on Mars and the third to land on Venus. I remember—I believe it was in the third great war—the blasting of Skoro from the sky by a force that compares to nuclear fission as a nova compares to our slowly dying sun. I was second in command on a Hyper-A Class spacer in the war against the second extragalactic invaders, the ones who established bases on Jupe's moons before we knew they were there and almost drove us out of the Solar System before we found the one weapon they couldn't stand up against. So they fled where we couldn't follow them, then, outside of the Galaxy. When we did follow them, about fifteen thousand years later, they were gone. They were dead three thousand years.

And this is what I want to tell you about—that mighty race and the others—but first, so that you will know how I know what I know, I will tell you about myself.

I am not immortal. There is only one immortal being in the universe; of it, more anon. Compared to it, I am of no importance, but you will not understand or believe what I say to you unless you understand what I am.

There is little in a name, and that is a fortunate thing—for I do not remember mine. That is less strange than you think, for a hundred and eighty thousand years is a long time and for one reason or another I have changed my name a thousand times or more. And what could matter less than the name my parents gave me a hundred and eighty thousand years ago?

I am not a mutant. What happened to me happened when I was twenty-three years old, during the first atomic

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war. The first war, that is, in which both sides used atomic weapons—puny weapons, of course, compared to subsequent ones. It was less than a score of years after the discovery of the atom bomb. The first bombs were dropped in a minor war while I was still a child. They ended that war quickly for only one side had them.

The first atomic war wasn't a bad one—the first one never is. I was lucky for, if it had been a bad one—one which ended a civilization—I'd not have survived it despite the biological accident that happened to me. If it had ended a civilization, I wouldn't have been kept alive during the sixteen-year sleep period I went through about thirty years later. But again I get ahead of the story.

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I was, I believe, twenty or twenty-one years old when the war started. They didn't take me for the army right away because I was not physically fit. I was suffering from a rather rare disease of the pituitary gland—Somebody's syndrome. I've forgotten the name. It caused obesity, among other things. I was fifty pounds overweight for my height and had little stamina. I was rejected without a second thought.

About two years later my disease had progressed slightly, but other things had progressed more than slightly. By that time the army was taking anyone; they'd have taken a one-legged one-armed blind man if he was willing to fight. And I was willing to fight. I'd lost my family in a dusting, I hated my job in a war plant, and I had been told by doctors that my disease was incurable and I had only a year or two to live in any case. So I went to what was left of the army, and what was left of the army took me without a second thought and sent me to the nearest front, which was ten miles away. I was in the fighting one day after I joined.

Now I remember enough to know that *I* hadn't anything to do with it, but it happened that the time I joined was the turn of the tide. The other side was out of bombs and dust and getting low on shells and bullets. We were out of bombs and dust, too, but they hadn't knocked out *all* of our production facilities and we'd got just about all of theirs. We still had planes to carry them, too, and we still had the semblance of an organization to send the planes to the right places. Nearly the right places, anyway; sometimes we dropped them too close to our own troops by mistake. It was a week after I'd got into the fighting that I got out of it again—knocked out of it by one of our smaller bombs that had been dropped about a mile away.

I came to, about two weeks later, in a base hospital, pretty badly burned. By that time the war was over, except for the mopping up, and except for restoring order and getting the world started up again. You see, that hadn't been what I call a blow-up war. It killed off—I'm just guessing; I don't remember the fraction—about a fourth or a fifth of the world's population. There was enough productive capacity left, and there were enough people left, to keep on going; there were dark ages for a few centuries, but there was no return to savagery, no starting over again. In such times, people go back to using candles for light and burning wood for fuel, but not because they don't know how to use electricity or mine coal; just because the confusions and revolutions keep them off balance for a while. The knowledge is there, in abeyance until order returns.

It's not like a blow-up war, when nine-tenths or more of the population of Earth—or of Earth and the other planets—is killed. Then is when the world reverts to utter savagery and the hundredth generaton rediscovers metals to tip their spears.

But again I digressed. After I recovered consciousness in the hospital, I was in pain for a long time. There were, by then, no more anesthetics. I had deep radiation burns, from which I suffered almost intolerably for the first

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few months until, gradually, they healed. I did not sleep—that was the strange thing. And it was a terrifying thing, then, for I did not understand what had happened to me, and the unknown is always terrifying. The doctors paid little heed—for I was one of millions burned or otherwise injured—and I think they did not believe my statements that I had not slept at all. They thought I had slept but little and that I was either exaggerating or making an honest error. But I had *not* slept at all. I did not sleep until long after I left the hospital, cured. Cured, incidentally, of the disease of my pituitary gland, and with my weight back to normal, my health perfect.

I didn't sleep for thirty years. Then *I did sleep,* and I slept for sixteen years. And at the end of that forty-six year period, I was still, physically, at the apparent age of twenty-three.

Do you begin to see what had happened as I began to see it then? The radiation—or combination of types of radiation—I had gone through, had radically changed the functions of my pituitary. And there were other factors involved. I studied endocrinology once, about a hundred and fifty thousand years ago, and I think I found the pattern. If my calculations were correct, what happened to me was one chance in a great many billions.

The factors of decay and aging were not eliminated, of course, but the rate was reduced by about fifteen thousand times. I age at the rate of one day every forty-five years. So I am not immortal. I have aged eleven years in the past hundred and eighty millennia. My physical age is now thirty-four.

And forty-five years is to me a day. I do not sleep for about thirty years of it—then I sleep for about fifteen. It is well for me that my first few "days" were not spent in a period of complete social disorganization or savagery, else I would not have survived my first few sleeps. But I did survive them and by that time I had learned a system and could take care of my own survival. Since then, I have slept about four thousand times, and I have survived. Perhaps someday I shall be unlucky. Perhaps someday, despite certain safeguards, someone will discover and break into the cave or vault into which I seal myself, secretly, for a period of sleep. But it is not likely. I have years in which to prepare each of those places and the experience of four thousand sleeps back of me. You could pass such a place a thousand times and never know it was there, nor be able to enter if you suspected.

No, my chances for survival between my periods of waking life are much better than my chances of survival during my conscious, active periods. It is perhaps a miracle that I have survived so many of those, despite the techniques of survival that I have developed.

And those techniques are good. I've lived through seven major atomic—and super-atomic—wars that have reduced the population of Earth to a few savages around a few campfires in a few still habitable areas. And at other times, in other eras, I've been in five galaxies besides our own.

I've had several thousand wives but always one at a time for I was born in a monogamous era and the habit has persisted. And I have raised several thousand children. Of course, I have

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never been able to remain with one wife longer than thirty years before I must disappear, but thirty years is long enough for both of us—especially when she ages at a normal rate and I age imperceptibly. Oh, it leads to problems, of course, but I've been able to handle them. I always marry, when I do marry, a girl as much younger than myself as possible, so the disparity will not become too great. Say I am thirty; I marry a girl of sixteen. Then when it is time that I must leave her, she is forty-six and I am still thirty. And it is best for both of us, for everyone, that when I awaken I do not again go back to that place. If she still lives, she will be past sixty and it would not be well, even for her, to have a husband come back from the dead—still young. And I have left her well provided, a wealthy widow—wealthy in money or in whatever may have constituted wealth in that particular era. Sometimes it has been beads and arrowheads, sometimes wheat in a granary and once—there have been peculiar civilizations—it was fish scales. I never had the slightest difficulty in acquiring my share, or more, of money or its equivalent. A few thousand years' practice and the difficulty becomes the other way—knowing when to stop in order not to become unduly wealthy and so attract attention.

For obvious reasons, I've always managed to do that. For reasons that you will see I've never wanted power, nor have I ever—after the first few hundred years—let people suspect that I was different from them. I even spend a few hours each night lying thinking, pretending to sleep.

But none of that is important, any more than I am important. I tell it to you only so you will understand how I *know* the thing that I am about to tell you.

And when I tell you, it is not because I'm trying to sell you anything. It's something you can't change if you want to, and—when you understand it—you won't want to.

I'm not trying to influence you or to lead you. In four thousand lifetimes I've been almost everything—except a leader. I've avoided that. Oh, often enough I have been a god among savages, but that was because I had to be one in order to survive. I used the powers they thought were magic only to keep a degree of order, never to lead them, never to hold them back. If I taught them to use the bow and arrow, it was because game was scarce and we were starving and my survival depended upon theirs. Seeing that the pattern was necessary, I have never disturbed it.

What I tell you now will not disturb the pattern.

It is this: The human race is the only immortal organism in the universe.

There have been other races, and there are other races throughout the universe, but they have died away or they will die. We charted them once, a hundred thousand years ago, with an instrument that detected the presence of thought, the presence of intelligence, however alien and at whatever distance—and gave us a measure of that mind and its qualities. And fifty thousand years later that instrument was rediscovered. There were about as many races as before but only eight of them were ones that had been there fifty thou-

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sand years ago and each of those eight was dying, senescent. They had passed the peak of their powers and they were dying.

They had reached the limit of their capabilities—and there is always a limit—and they had no choice but to die. Life is dynamic; it can never be static—at however high or low a level—and survive.

That is what I am trying to tell you, so that you will never again be afraid. Only a race that destroys itself and its progress periodically, that goes back to its beginning, can survive more than, say, sixty thousand years of intelligent life.

In all the universe only the human race has ever reached a high level of intelligence without reaching a high level of sanity. We are unique. We are already at least five times as old as any other race has ever been and it is because we are not sane. And man has, at times, had glimmerings of the fact that insanity is divine. But only at high levels of culture does he realize that he is collectively insane, that fight against it as he will he will always destroy himself—and rise anew out of the ashes.

The phoenix, the bird that periodically immolates itself upon a flaming pyre to rise newborn and live again for another millennium, and again and forever, is only metaphorically a myth. It exists and there is only one of it.

You are the phoenix.

Nothing will ever destroy you, now that—during many high civilizations—your seed has been scattered on the planets of a thousand suns, in a hundred galaxies, there ever to repeat the pattern. The pattern that started a hundred and eighty thousand years ago—I think.

I cannot be sure of that for I have seen that the twenty to thirty thousand years that elapse between the fall of one civilization and the rise of the next destroy all traces. In twenty to thirty thousand years memories become legends and legends become superstitions and even the superstitions become lost. Metals rust and corrode back into earth while the wind, the rain and the jungle erode and cover stone. The contours of the very continents change—and glaciers come and go, and a city of twenty thousand years before is under miles of earth or miles of water.

So I cannot be sure. Perhaps the first blow-up that I knew was not the first; civilizations may have risen and fallen before my time. If so, it merely strengthens the case I put before you to say that mankind *may* have survived more than the hundred and eighty thousand years I know of, may have lived through more than the six blow-ups that have happened since what I think to have been the first discovery of the phoenix's pyre.

But—except that we scattered our seed to the stars so well that even the dying of the sun or its becoming a nova would not destroy us—the past does not matter. Lur, Candra, Thragan, Kah, Mu, Atlantis—those are the six I have known, and they are gone as thoroughly as this one will be twenty thousand years or so hence, but the human race, here or in other galaxies, will survive and will live forever.

It will help your peace of mind, here in the year 1954 of your current era, to

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know that—for your minds are disturbed. Perhaps, I do know, it will help your thoughts to know that the coming atomic war, the one that will probably happen in your generation, will not be a blow-up war; it will come too soon for that, before you have developed the really destructive weapons man has had so often before. It will set you back, yes. There will be darkish ages for a century or a few centuries. Then, with the memory of what you will call World War III as a warning, man will think—as he has always thought after a mild atomic war—that he has conquered his own insanity.

For a while—if the pattern holds—he will hold it in check. He will reach the stars again, to find himself already there. Why, you'll be back on Mars within five hundred years, and I'll go there too, to see again the canals I once helped to dig. I've not been there for eighty thousand years and I'd like to see what time has done to it and to those of us who were cut off there the last time mankind lost the space drive. Of course they've followed the pattern too, but the rate is not necessarily constant. We may find them at any stage in the cycle except the top. If they were at the top of the cycle, we wouldn't have to go to them—they'd come to us. Thinking, of course, as they think by now, that they are Martians.

I wonder how high, this time, you will get. Not quite as high, I hope, as Thragan. I hope that never again is rediscovered the weapon Thragan used against her colony on Skora, which was then the fifth planet until the Thragans blew it into asteroids. Of course that weapon would be developed only long after intergalactic travel again becomes commonplace. If I see it coming I'll get out of the Galaxy, but I'd hate to have to do that. I like Earth and I'd like to spend the rest of my mortal lifetime on it if it lasts that long.

Possibly it won't, but the human race will last. Everywhere and forever, for it will never be sane and only insanity is divine. Only the mad destroy themselves and all they have wrought.

And only the phoenix lives forever. ■

●If it looks like a duck, walks like a duck, and quacks like a duck, then it's either a duck or a good imitation.

Kelvin Throop

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Ben Bova

editorial courage

In that wonderful old film, *The Wizard of Oz*, Bert Lahr sings a song called, "Courage." As the Cowardly Lion, he was seeking courage, an estimable trait which he described thusly:

"What makes a king out of a slave?
"Courage!
"What makes a flag on a mast wave?
"Courage!"
And so forth.

Courage is a quality that we usually think of in association with grave physical danger: courage, heroism, bravery—these are the qualities we seek in warriors, leaders, men and women who risk their lives in battle.

But people can show courage in much more peaceful pursuits. And the lack of courage, when it comes from a bureaucrat or an office worker, can be just as devastating as cowardice in a soldier. The only difference is, it is rarely noticed or punished.

Take the matter of censorship, for example.

Everything you read (even in *Analog*) is preselected for you by editors, reporters, publishers, writers, copy-editors . . . sometimes even a clumsy-fingered printer will have more to say about what you read than you realize.

Back in 1950, I wrote a science fiction novel. Its title is not significant, because it never got published. Like most first novels, it was so poorly written that it's probably a mercy that it was never published. But that wasn't the reason for its consignment to editorial oblivion. Not the entire reason, at least.

The novel dealt with a typically silly science fiction premise; typically silly for the very early 1950s, that is. The basic idea was that, sometime in the incredibly distant 1970s or '80s, the Russians would be far ahead of the Americans in space experiments. The Reds would have artificial satellites in orbit around the Earth, and American

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intelligence suspected that they were planning a manned landing on the Moon. With incredible effort, America put together a crash program that successfully put an American on the Moon ahead of the Russians.

I had, in essence, predicted the Space Race of the sixties.

But publishers showed no interest in such a book. As most new writers do, I thought they were simply telling me that the writing was lousy, and/or the idea was ludicrous.

But then one editor showed a tiny amount of courage. He told me, "Look, this is no worse than a lot of the fiction we publish, as far as the writing is concerned. It needs work, of course, but you can improve it. The trouble is," and he grimaced, "there's this Senator Joe McCarthy rampaging around the country. He'd come down on us hard for publishing a book that suggested the Russians could get into space before we could."

Senator Joe was finding Communist plots all over the place, you see, and denouncing anyone he chose to denounce for being "soft on Communism." He finally took on the U.S. Army while General Eisenhower was President, and that broke him. But before that happened, he unknowingly scuttled my first novel.

No publisher had the courage to put out a novel that they thought might be noticed unfavorably by Senator McCarthy.

It was no great loss, literarily. And after a quarter-century I finally did publish a much-changed descendant of the first novel, under the title *Millennium*.

But the experience sent me scurrying into history books to see what our Founding Fathers had said about censorship. They wrote a First Amendment into the Constitution that guarantees "freedom of the press." But their arguments about freedom of the press included very detailed discussions of the perniciousness of censorship. One of the discussions went this way:

If an official censoring system is set up, not only will it tend to prohibit publication of the government's mistakes, but it will discourage publishers from even thinking about printing things that the government would frown on. This kind of precensorship is the deadliest censorship of all, because it means that "unpatriotic" ideas will never see print. It's one thing for the government to impound books or pamphlets it doesn't like; it's quite another for publishers to refuse to print something because of their fear of the government's reaction to it.

Well, McCarthyism died in the fifties and all is well.

Oh yeah?

Last year, I was approached by an organization called the Children's Book Council to write and then narrate an audio tape for school teachers, on the subject of—what else?—science fiction. The Children's Book Council (CBC) is a private, nonprofit organization aimed at promoting children's books, especially in schools and libraries. In essence, CBC helps publishers to sell children's books.

Over the course of several months, working with one of CBC's consulting editors, I wrote a script for a half-hour-

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long presentation. First the outline was reviewed, commented on, rewritten, and finally approved. Then the script itself was reviewed and okayed, with a couple of minor quibbles.

One of the quibbles was about the following paragraphs:

In 1940, Heinlein wrote a novelette called "The Roads Must Roll." The story dealt with a cross-country network of moving roads—gigantic conveyor belts that carried cargo and passengers across the U.S. The plot of the story dealt with a strike by the engineers and technicians who run the roads, a strike that could cripple the whole nation.

Heinlein's technological prediction was nonsense. We don't have rolling roads. But we do have interstate highways, and the sociopolitical predictions in Heinlein's story were uncannily prophetic. He showed that once an efficient, convenient network of interstate roads was completed (no matter what their gadgetry) the major cities of the United States would begin to sprawl out along those roads. And the people who controlled those roads—such as our modern-day truckers and Teamsters Union—would gain enormous political power all across the nation.

It was that line about the Teamsters that got CBC upset. Their editor suggested to me that I drop the reference to the union. I demurred, saying that there was nothing inaccurate or derogatory about the line—it was simply a statement of fact. I read my script as written, and the tape was made on one sitting. Everybody was happy.

Except the man who gives legal advice to CBC. He wrote:

Dear Ben:

As I mentioned when we chatted briefly the other day, I think your SF tape . . . is terrific. Alas, we do have a problem with your allusion to the Teamsters Union . . . in my judgment, this is an actionable statement. I understand and appreciate your strong feelings on this matter, but the fact is that the Children's Book Council is in the business of promoting interest in children's books, not making our lawyers rich in a possible suit against us. . . . Frankly, we don't have either the inclination or the funds to get involved in court action as a result of this tiny libelous allusion.

He suggested that: (a) I grant CBC permission to snip the offending words from the tape; or (b) I sign an agreement to the effect that I would bear all legal costs if anybody sued them; or (c) I return to the recording studio and dub in a softer line.

Shaking with righteous wrath at this precensorship, I suggested in a return letter that they either take my words as I wrote and spoke them, or drop the whole project.

His response was also heated:

Dear Ben:

Thanks for letting me know how you stand about the Children's Book Council's interest . . . in creating more support for children's books. I guess it's more important to you to make a statement through and at the possible expense of the Council about

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a . . . Teamsters Union than it is to help teachers, librarians, etc. As we all respect you, of course we won't use your . . . tape. I'm sorry about that, because in every other respect I think it's terrific.

Note the elipses in the quotations from his letters. They are necessary here because his statements about the Teamsters Union were unkind enough to be considered libelous by an unbiased lawyer. I never suggested that the Teamsters were anything other than politically powerful. I wrote back, suggesting that he was reading evil tidings into my script that simply were not there. I further suggested that he contact the Teamsters' legal counsel, and see what they thought of the tape—also advised him to read Thurber's "The Male Animal."

We exchanged a couple of more letters, with neither side budging from its position. I took the liberty of calling the Teamsters International office in Washington. I spoke with a Mr. Allan Biggs, of the public relations department. He listened to my paragraph politely, then complained:

"We don't *control* the roads. The state legislatures and the big companies control them."

No complaint about insulting the Teamsters' honor or about the reference to their political power.

And that's where the matter stands. Several months of work (both mine and CBC's) have been wasted. I was paid for the work, of course, but that's scant consolation for a tape that will never be played to its intended audience.

Precensorship. Bowing down before the boss. Doing unto yourself before he does it unto you. The next time you begin to grumble about some investigative reporter's exposure of crime or corruption, get down on your knees and thank God that there are still some publishers who have the courage to report the news as it happens. Don't blame the messenger for the bad news. As Bert Lahr put it:

"What makes the Hottentots so hot?

"Courage!

"What have they got that I ain't got?

"Courage!"

There are a lot of Cowardly Lions sitting behind desks in every city of the world. The real trouble is, they don't even *want* to find their courage. ■

● I rejoice in the multifariousness of nature and leave the chimera of certainty to politicians and preachers.

Stephen Jay Gould
submitted by Dick Mason

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the reference library

By Tom Easton

The Abyss, Orson Scott Card, Pocket Books, $4.50, 363 pp.

The Folk of the Fringe, Orson Scott Card, Phantasia Press (5536 Crispin Way, W. Bloomfield, MI 48033), $22.00, 245 pp.

Light Raid, Connie Willis and Cynthia Felice, Ace, $17.95, 229 pp.

Yesterday's Pawn, W. T. Quick, NAL/Signet, $?, 255 pp.

A Fire in the Sun, George Alec Effinger, Foundation/Doubleday, $18.95, 291 pp.

Buying Time, Joe Haldeman, Morrow, $18.95, 330 pp.

Angel Station, Walter Jon Williams, TOR, $18.95, 448 pp.

The Long Run, Daniel Keys Moran, Bantam, $3.95, 384 pp.

Pulphouse 3, Kristine Kathryn Rusch, ed., Pulphouse Publishing (Box 1227, Eugene, OR 97440), $17.95, 308 + x pp.

Westlin Wind, Charles de Lint, Axolotl Press (Pulphouse Publishing, Box 1227, Eugene, OR 97440), 500 copies trade pb @ $10.00, 300 signed and numbered hb @ $35.00, 100 signed and numbered leatherbound @ $65.00, 92 pp.

The Year's Best Science Fiction: Sixth Annual Collection, Gardner Dozois, ed., St. Martin's, $24.95 hb, $13.95 pb, 596 + xxiv pp.

The 1989 Annual World's Best SF, Donald A. Wollheim with Arthur W. Saha, eds., DAW, $3.95, 315 pp.

Crystal Express, Bruce Sterling, Arkham House, $18.95, 264 pp.

Yes, Let's: New and Selected Poems, Tom Disch, Johns Hopkins University Press, $16.95 hb, $8.95 pb, 114 pp.

By the time you read this, the movie *The Abyss* will long since have been released. You will have seen it. You will have loved it, or hated it, or shrugged it off as imitation *Aliens*.

You probably weren't a bit surprised to see a novelization on the stands. That is, after all, the way the movie biz works. You may, however, have been astonished to spot Orson Scott Card's name on the novelization. Isn't he, you may have asked yourself, above such hackwork? Doesn't he have better things to do? Has he, too, sold out to commerciality?

Well, in the book's afterword, he takes some pains to explain that **The Abyss** is *not* just another "novelization," a term that tends to mean a hasty job of turning a screenplay into prose without ever seeing how the screenplay translated into film, and therefore means a book that must strike any halfway discerning reader as bearing only a slipshod relationship to that film. In this case, Card explains, he was able to work so closely with James Cameron, screenwriter and director, that he worked as much from film as from script. What's more, some of the material he invented for the book actually flowed the other way, into the film. Book and film therefore bear to each other a far closer relationship than is usual for novelizations, or even for "filmizations" that begin with the book.

I presume you know whether the movie is any good. I don't, for as I write this, its release is still in the future. I have to judge the book as an independent entity, as a stand-alone novel. Happily, I can tell you that it works very, very well. Card, as always, develops

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strong, sympathetic characters and puts them into situations that let us care about them. An alien scout, returning to its base in the depths of the Cayman Trench (in the Carribbean), catches a nuclear sub in its wake. The sub sinks. The government preempts the *Deepcore*, an underwater oil-drilling platform and its crew, headed by Bud Brigman, a man who knows just how to keep people working together smoothly. Bud's estranged wife, Lindsey, designed the platform, and she too is preempted (or preempts herself), while a team of efficiently murderous order-followers, Navy SEALs, is sent to rescue codebooks and warheads and, if necessary, blow the whole shebang all to blazes. Meanwhile, a hurricane is moving into the area, forcing contact with the support ship on the surface to be lost. People begin to go crazy, the aliens, puzzled about those madly murderous humans, make themselves known, the SEALs decide to destroy the aliens, the drillers try to save the aliens, and . . .

High-pressure drama. Non-stop suspense. Immense differences between humans and humans, between humans and aliens, even between aliens and aliens. The slow recognition of commonalities between humans and humans, humans and aliens, aliens and aliens. Convergence. Resolution. Peace, or at least its potential. Cinematic as can be, and a grand read as well.

Card shows his prodigious talents in another way with **The Folk of the Fringe,** a collection of five stories exploring what the aftermath of armageddon might mean for his people, the Mormons. Most of the stories have been published elsewhere; only one, "Pageant Wagon," is new here. All are excellent. All belie the way Michael Collings, in his afterword, marvels at the fact that Card can meld the Mormon myth and science fiction so effectively. I say "belie" because the function of SF *is* to meld itself with myth, to portray the *meaning* of the or a future to people of today with a shared past. And though the Mormon myth is not a mainstream myth (outside Utah), it is certainly a component of the American mythic tapestry. And Card speaks as well to our concern for the humanity of persecuted minorities.[1]

In **Light Raid,** Connie Willis and Cynthia Felice have painted a twenty-first century North America in which climate change has made necessary a technology of bioengineered "hydras" that draw water from deep in the ground, and political changes have pitted an East apparently dominated by Quebec against a Western US allied with a royalist Commonwealth (central Canada); British Columbia is neutral. The war is fought by spies and pin-point laser strikes from orbit, the "light raids" of the title.

This much is easy enough to accept. What is harder to swallow is the authors' literalization of the idea of "corporate culture." Workers are born into their companies, and they wear clothes and

[1] It would be great fun to go on at length about how Card's work in SF continues a Mormon tradition begun when that great fantasist Joseph Smith made up the Book of Mormon out of whole cloth (yes, I know, Smith claimed otherwise, and the Mormons claim to believe him). I've read that Book, and quite clearly its truth is not that of history, but of sense and sensibility, of myth, of art, as is Card's own truth (the Christian and Hebrew scriptures have the same truth, of course, but they also have documented—as by archeologists—historical underpinnings) But elevating such a discussion here to any level higher than that of this footnote would be far too likely to start an unproductive and divisive fight. (Even this much may be enough to start the letters flying.) I'd rather see some literary scholar tackle the topic for a dissertation or monograph.

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bear names that reflect those cultures. In the Hydra Corporation, for instance, people are "Hellene Ariadne" and "Hellene Dares" and wear classical Greek chitons. In another company, the dress is Victorian. Yet the Hellene mode seems more widespread, for Greek dress seems to be the default costumery of Canadian royalists and others as well.

The problem here is the implication of vast cultural shifts without any hint of how they came about, and that leaves the reader in a state of continual perplexity that interferes with appreciation of the story itself, which isn't bad at all, though it does seem targeted to adolescent girls.

Here's the gist: Ariadne, daughter of a Hydra Corp. researcher, is in Victoria as a refugee from the light raids. Growing suspicious that all is not well at home, she runs away, sneaks home to Colorado, finds the house in ruins, gets collected by the equerry of the prince who has taken over Hydra, finds her mother is imprisoned for treason and her dad is a broken sot, and sets out to figure out what the devil is going on. She vows to seduce the prince, falls for the equerry who falls for her, becomes tangled in webs of intrigue, meets a wicked aunt, escapes, is caught, escapes again, produces the technological gimmick that will win the war, and lives happily ever after. Plenty of action, romance, and suspense, with emphasis on the romance.

W. T. Quick moves way beyond his *Dreams of Flesh and Sand* and *Dreams of Gods and Men* with **Yesterday's Pawn,** yet he remains on the same track. Garry is working for his father, Garth, in the family pawnshop on the capital world of the H'hogoth, saurians who some time back gifted humanity with a stardrive that travels backward in time. To protect themselves from anyone tempted to monkey around with their history, they insist that humans accept as an adjunct to the drive the "time-band," which counteracts the backwards time travel. Naturally, humans resent the constraints imposed by the lizards and have mounted the "Search" for a true ftl drive. Garry runs into the Search when a battered bum comes to the pawn shop with a strange alien device. Shortly thereafter, the shop is attacked, the device stolen, and his father killed. He is on his own, although he soon acquires a stranger who uses the proper passwords to say he is an ally. The goal now is to find the device, claim it for Earth, and gain revenge. Soon enough, they reach a world named "Arius" (sound familiar?) and begin to learn what is really going on. Now the connections with the earlier books become clear.

Something else becomes clear as well. In his ending, to my mind, Quick reveals that he reveres the immortal James Blish, for when Garry creates a universe that is more truly human, Quick seems to borrow from the ending of the *Cities in Flight* series. More I will not say, except: Good stuff; buy it, and enjoy.

George Alec Effinger's last novel was the gritty, cyberpunkish, Nero Wolfean *When Gravity Fails*. It drew raves from many people. I liked it but called it derivative, too bent on paying homage to the author's predecessors.

Now we have the sequel: **A Fire in the Sun.** Yes, it too pays homage, this time to the tough guy school of detective writing. Hero Marid Audran actually buys a Mike Hammer "moddy" (a personality module that plugs into the brain via a surgically installed socket) and wears a pain-deadening "daddy" (add-

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on personality supplement). And he needs both. He is still in the Budareen, the low-life district of a decadent North African city, in a twenty-second century when political chaos is the norm. He is, as at the end of *Gravity*, employed by Friedlander Bey, serving as the crime-lord's liaison with the police. Yet Bey is not just a crime-lord; that is merely how he provides employment for his surplus hangers-on; his empire is far more soundly based on providing information to governments whose immediate predecessors trashed the national data-bases before fleeing to Switzerland. Nor is Audran a mere thug. He takes his police work rather more seriously than the venal cops around him, and he pursues unsolved murders, a "Phoenix File" his cop partner was investigating before he was killed, and other clues into a head-on crash with Bey's prime competitor and disturbing discoveries about Bey and his own ancestry and inner nature.

I enjoyed this one a bit more than the first. Effinger is translating classic crime fiction into a future world as gritty and decadent as any underworld beloved of Spillane, Chandler, or MacDonald (both of them), and he does it well. And yes, the title once more carries a freight of double meaning.

The last two Joe Haldeman novels to come my way didn't impress me tremendously. The skill of a master was there, yes, but the stories themselves made me think that he was taking it easy. Would he, I wondered on both my and your behalf, ever impress us again?

If you really wish an answer to that question, grab a copy of **Buying Time.** The time is the mid-21st century. The gimmick is that just a few short years from right now, an absolutist idealist, Lord Stileman, will fund the development of a kind of immortality, based on a thorough medical reaming that must be repeated every 10 to 12 years. To prevent immortals from taking over the world, Stileman set it up so that whoever underwent the Stileman Process paid one million pounds or his or her entire assets, whichever was greater. Since the secret of gaining wealth, says Haldeman, is at least as much who and what you know as how much wealth you already have, this has certain effects on the lifestyles of the rich and famous.

Enter Dallas Barr, freshly rejuvenated and on the prowl for his next million. A fellow immortal tells him of a secret cabal with its eye on world "guidance" (*not* domination). When Barr rejects the offer of membership, assassins take aim at him. Happily, he has been around awhile, has learned to be properly paranoid about setting up boltholes, and has a pretty good idea of how to handle himself in a crisis. The bodies begin to accumulate. Frustratingly, the world's media are touting Barr as the killer, not just of his would-be assassins but also of other immortals, including the man who first told him about the cabal. Obviously, someone with both money and power is stacking the deck.

Naturally enough, Barr flees, first on Earth, then into space, to the asteroids where he finds allies and the secret truth about the Stileman Process and gains a strong inkling of what the true nature of the cabal really is. Along the way, he finds a lost true love and nearly loses her again, and she in turn discovers unsuspected potentials in the Stileman-Processed body.

They win, of course. What experienced reader could have suspected otherwise? But getting there is all the fun, and the journey is Haldeman's way of telling us that absolutist idealists may seem to be offering beautifully logical,

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sane, well-designed ideas for the betterment of humanity, but there are many more pragmatic egotists just waiting to exploit the inevitable loopholes. Reality requires compromise. So does growing up.

I enjoyed this one, and I recommend it highly to you. It's Haldeman at or near the top of his form.

Is imitation truly the sincerest form of flattery? Then on the evidence of his latest, **Angel Station,** Walter Jon Williams must think very highly of C. J. Cherryh. The book strikes me as far too slavishly derivative of the latter writer. The title, for instance, could be taken more directly from one of hers (by the tactic of opposition) only if it were *Upabove Station*. As for the meat of the book, he offers us a future whose commerce is dominated by vast orbiting stations, whose merchants are independents threatened by vast combines, and whose ships leap through black holes. He changes the jargon, he gives the whole his own touches, and by and large I enjoyed it, but the book's feel remains so familiar that I think it worth mentioning.

The story opens with the suicide of Pasco, an incompetent shipmaster who never finishes what he starts. He is on the verge of bankruptcy. He leaves behind two force-grown teenagers, Ubu Roy and Beautiful Maria, "his" kids because he assembled their zygotes from genebank material and brought them to birth in an autowomb. Ubu has a perfect memory; Maria can sense and manipulate subatomic events; somehow, they must use their talents to keep their ship in business and, if possible, prosper.

Sadly, like Pasco, they are losers. They overextend badly on their first deal. When their assets are seized, they break loose from Angel Station and flee to the interstellar wilderness, hoping to make their fortune. Naturally, this being fiction, they do, if not quite in the way they had imagined. They encounter aliens in pretty much their own bind, find a basis for trade, and return to human civilization with wealth enough to buy themselves out of trouble and found a commercial empire.

But they're still losers. They let another merchant, unscrupulously self-motivated, steal their secret. Only then do they realize that they are locked into their father's pattern and resolve to break that pattern, no matter what it takes.

It takes a lot, of course. It always does, in the future, now, or in the past. What we learn from our parents is as deeply embedded in our mind as almost anything you can name, and breaking free to make our own pattern is a painful—if necessary—process.

Last May, I praised Daniel Keys Moran's *Emerald Eyes*, a tale of genegineered telepaths destroyed by the world-controlling UN. I also told you there would be sequels—many of them!—in Moran's "Tales of the Continuing Time." And here's one of those sequels: **The Long Run.** The protagonist is Trent, the only nontelepathic Castanaveras and one of the very few survivors of the destruction. In *Eyes*, he displayed a talent for merging his mind with the world of computer data (the Crystal Wind), à la cyber-punk. Now that talent is more fully developed: Trent is a thief who uses his intimacy with computers to prey upon the UN-dominated establishment.

Of course, the UN has characters who would love to get this sucker, including one, Mohammed Vance, whom readers will recall from *Eyes*. A mysterious warning saves Trent and his friends

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from a trap. He meets another Castanaveras survivor, whom he loves. He is imprisoned in an escape-proof jail, and his friends come for him. He escapes, and when the UN Peaceforcers pursue, he leads an indestructible Peaceforcer Elite cyborg to his death.

Now they *really* want this sucker. But Trent is Trent the Uncatchable, a Trickster God of far-future myth, essential to the development of that future. He also has the heroic knack of always doing just the right thing, having just the right gimmick up his sleeve, making just the right plans, being in just the right place at just the right time. He is eminently successful at making the Peaceforcers look like fools. And at story's end, he is on the verge of the greatest theft in the history of computer crime. Will he succeed? Stay tuned for the next installment.

I find Moran's "Continuing Time" growing on me. If he can keep it up, he will gift us with one of the greatest series in memory. Don't miss.

Pulphouse 3, the spring 1989 issue of "The hardback magazine," does its best to convince us that we have in this small press, limited edition (1,000 copies numbered trade; 250 leather, signed, and numbered, at $50) a thing that deserves to endure. Editor Kristine Kathryn Rusch has once again done a marvelous job of gathering material, this time in a fantasy vein.

The contributors include (among others) Harlan Ellison, Steve Perry, Ronald Anthony Cross, William F. Wu, Alan Brennert, Esther M. Friesner, Avram Davidson, Michael Bishop, Ron Goulart, Nina Kiriki Hoffman, and Charles de Lint (with one of the tales with which he gifts his wife and friends at Christmas). Add in short articles by Elizabeth A. Lynn (on "The Risks of Fantasy"), Jon Gustafson (on fantasy art), and Jack Williamson (on plot), and you have an anthology that can't be bettered for the price. Don't miss.

The same publisher, under its Axolotl Press imprint, has also brought out a novella by Charles de Lint. It's **Westlin Wind,** a sequel to his *Ascian in Rose,* in which Esmeralda Foyan returns to a strange Ottawa house that has an apparent life of its own. Esmeralda has been summoned: Her friend Emma has fled her mystic talents and is now lost in the spirit world, her body lies in a coma in a hospital bed, and she must be saved.

The spirit world has two levels. We see the first, an alternate America (perhaps) in which the Amerindians still dwell, sensitive to spirits, and an elderly shaman is trying to exorcise a strange ghost; he summons the moon, queen of the dead, to show the ghost the way to the second level, where the dead await rebirth. In our reality—or that of de Lint's fey Ottawa—there are elements of faery, one of which steals Emma's body for sacrifice. Esmeralda must gather Emma's lover and his biker buddies to save Emma's body while she herself pursues the spirit.

De Lint's reality is a strange one, where the everyday and the supernatural walk side by side, hand in hand, as if the latter were not "mere" fabulation. Yet he makes it work, and work well. His reality is a charming place of great poetic truth.

Gardner Dozois's **The Year's Best Science Fiction: Sixth Annual Collection** is now available, and it's just what you'd expect: massive, thorough, and heavily weighted (11 out of 28 stories) toward his own magazine. The contents include 9 of those stories that made the Nebula ballot, including two winners (Connie Willis's novella "The Last of

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the Winnebagoes'' and George Alec Effinger's novelette ''Schrödinger's Kitten''). Of the remaining 10 Nebula ballot stories, only 5 made Dozois's list of honorable mentions.

DAW's **The 1989 Annual World's Best SF,** edited by Donald A. Wollheim with Arthur W. Saha, is, as usual, an interesting comparison with the Dozois collection. There's some overlap (3 of 11 stories), there's a heavy lean toward *Asimov's SF* (4 of 11), and there are three stories—David Brin's ''The Giving Plague,'' Tanith Lee's ''A Madonna of the Machine,'' and Jack Chalker's ''Adrift Among the Ghosts''—which Dozois did not include even in his list of honorable mentions. There are only two of those stories that made the Nebula ballot, but one (''Schrödinger's Kitten'') was a winner.

What can we make of the comparison? Nothing profound, certainly. No two lists of ''The Best'' of anything will satisfy everyone, and SF is no exception. We may, however, take what overlap exists as a sign that at least some of the stories in the ''Best'' anthologies and on the Nebula ballot are indeed the best of the year. You may not be able to tell which ones, but you can, if you buy both anthologies, declare with some confidence, ''I've read the best!''

Noted but not read: Bruce Sterling's Arkham House collection, **Crystal Express,** begins with the five stories of his Shaper/Mechanist series, which evocatively portrayed the development of the symbiosis of humans and their various technologies, and first brought Sterling to broad attention. To these tales, the book adds three more pieces of science fiction and five of fantasy. An excellent package, nicely illustrated by Detroit computer artist Rick Lieder.

We all know Tom Disch as the immensely talented author of *Camp Concentration, The Brave Little Toaster* and its sequel, and other SF books. He's also a poet capable of some very interesting work, and I call to your attention **Yes, Let's: New and Selected Poems.** The SF element is small, but he's one of our own and if you have any taste for modern poetry at all, you will surely find in the book something to enjoy.

Keep Watching the Skies department: The book's puff sheet notes that Disch has two new novels in the works: *The M.D.: A Horror Story* and *A Troll of Surewould Forest: A Post-Modern Pantomime for the Reading-Impaired.*

May I call your attention to a new small press magazine? It's *The Sterling Web,* it sells for $4.75 an issue or $18 for four issues (a year), and it offers SF, fantasy, and horror, short stories and poetry. The first issue appeared in the spring of 1989.

Though the editors, Ann Kennedy and Amy K. Mann, apologized vigorously because it was the first time they had ever tried such a thing, it really didn't look bad. The physical product was quite neat and clean for amateurs, some of the stories were interesting, and I have a feeling the learning curve will be fairly steep.

If you're interested, write to: Ann Kennedy, Arachnid Publishing, P. O. Box 38383, Tallahassee, FL 32315.

Another small, new magazine is Jimm Gall's *Hardware* (710 Adeline Street, Trenton, NJ 08611-2618). The first issue (Spring 1989; order it for $3.50) contains poems and stories by Gall, Bruce Boston, Robert Frazier, Lee Ballentine, Paul Di Filippo, and myself. The theme is the idea that humans and their machines together make a whole greater than the sum of the parts. Call it technophilia, or even technomania. ■

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brass tacks

Dear Stanley Schmidt:

You really dismay me with this editorial defending traditional usage of the word "he." There would be nothing wrong if you risked a bit of innovation (as in science-fiction) and changed to the form s/he. This does serve the modern effort to override or disregard gender differences.

It is simple and easy to print, does not require much intelligence for the reader to get the concept, and likely to offend only the extreme pro-male macho minority of readers.

Some time ago, having decided as an editor to avoid gender bias, I have used the s/he with general acceptance worldwide. This word chopper gives me a chance to think about what I am writing, and I can see the last half-dozen words before they hit the paper. I use this limited editing capability to find ways to avoid the awkward "him or her" phrase. Also, a bit of innovation, to cut 'himself' down to simply, 'self' works quite well.

For perspective, I am sure that the Oxford English Dictionary does not include the term word-chopper (invented here, by yours truly), nor any of the several definitions of astrology likewise coined here.

Also, there is no hint in the review of the OED in The Daily Fairy Tale (also known as *New York Times*) that there has been any scientific (statistical) proof of the validity of the English (or any other) language.

Tradition is not proof of anything but well-worn habit(s), it neither has nor needs any scientific proof/disproof, and is quite susceptible to innovation.

Do you have to appear so rigid?

AL H. MORRISON

New York, NY

Maybe I'd appear less so if you'd read what I wrote more carefully. I ad-

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dressed the points you raise (for example, of course I've heard of s/he, and I mentioned the difficulty of getting people to accept such things); you haven't addressed mine.

May I suggest that you also read the following letters—and notice who wrote them?

Dear Stan,

I hardly ever bother writing any editor, but this time I couldn't resist. I want—no, I *have* to comment on three things in the June '89 issue. (You're in luck—I have strong opinions on lots of things!)

The first is about your editorial. I have much praise and only one complaint. You're too polite, Stan! I have only one thing to say to feminists who get bent out of shape about gender pronouns: So what's your point? Humpty Dumpty said it all. "When I say a word, it means exactly what I mean it to say, no more, no less."

I and my four sisters are self-confident and have no need of anybody's approval. We are all voracious readers. Not one of us has ever been offended by the use of "he" in a generic connotation. I feel that our lack of paranoia on this subject is directly related to our confidence in our womanhood. The feminist movement has always bored all of us. Whenever a man or a woman tried to walk on any of us, we broke his or her feet!

Words are indeed tools. However, they are also mathematical formulae. Generic pronouns and nouns use equal signs. Any woman who believes they do not is burning up her time and energy on a frivolous subject.

The second comment I wanted to make was about Mr. Sprague de Camp. I liked his remarks about how similar we are to the various apes and monkeys. However, I think he should read one of the best books I ever came across. It is titled *The Descent of Woman*. Not surprisingly, it is one woman's view of evolution. The authoress is an anthropologist, but I can't remember her name. If I ever get my hands on another copy, it's going to belong to me.

Her theory of evolution as pertaining to the human species answered all of my questions and cleared the confusion Darwin left me with. She makes *sense*. Look for it and write another article, please!

One other comment on his article is his line "the most fantastic fictions, such as those that form the basis for most cults and religions." YEOW! Mister, I salute you. After the whoopte-doo over Salman Rushdie, that takes guts.

PEGGY PERRY
P.O. Box 601
Luling, TX 78648

Dear Dr. Schmidt:

I agree with your editorial, "Tools of the Trade." While English is sorely in need of a singular, general, non-gendered pronoun, writers and speakers are limited by the tools available. Creative substitutes work only when they do not impede the flow of communication.

I would like to expand on the thought a bit. Removing sexism from language will not automatically remove sexism from society because society shapes language, not the other way around. Sexism in language is a reflection of society, not a cause of it; it is a symptom rather than the disease.

Similarly, many schools have foolishly banned the works of Mark Twain as "racist," which is a ridiculous charge. Twain did not espouse racism, he merely depicted it as it existed. Not only that, but he depicted it in such a way as to

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show the illogic and wrongness of it. I vividly remember, in junior high school, when *Tom Sawyer* made me understand the horror of racism that lies in its casual, pervasive, mundane invisibility.

Do not, however, discount too much the power of a mere word. Also in junior high school, I went on a field trip to Washington DC, which included a visit to the FBI building. The guide stopped the group in front of a marble wall inscribed with some sort of FBI motto.

I have forgotten the words of the motto, but I remember the words of the guide clearly. With a smug, nasty little smile, he pointed out that the first requirement for an FBI agent was listed in the first word of the motto: "He". An agent had to be a man. With a single pronoun, he had told me that I was unfit to serve my country in that capacity.

(Note: my opinion of the FBI has changed greatly since then, and I do not grieve over the lost opportunity.)

I also have a more recent example. My business partner and I wrote to the city of Los Angeles to get a copy of the "Request For Proposals" for the development of electric vehicles. The RFP came to us with a cover letter which stated emphatically that all participants must not have any dealings with South Africa, and must meet certain minimum quotas for participation by minorities and women.

The letter began, "Gentlemen:"

I believe that when sexism has been removed from society, non-gendered general pronouns and forms of address will present themselves and be accepted. The acceptance of "Ms." was a move in that direction. Until then, we will have to make do with the language available, using substitutes where possible, and granting dispensations where substitutes won't work.

Thank you for your sensible editorial on the subject.

SHARI PRANGE

Bonny Doon, CA

Dear *Analog*,

Stan Schmidt's editorial in the June issue bemoaning the lack of a gender-free pronoun reminded me of a letter I wrote to the editor of U. of Arizona Wildcat circa 1967. At the time it was written, it was meant to be taken rather lightly. . . .

Now that the trivial bickering over the Administration's totalitarian fee-raising tactics has subsided somewhat, I feel it my duty to return to the ever-present battle to secure our civil liberties. Consequently, I salute the Wildcat for its use of "Ms." It is good to know that our campus newspaper is in the forefront of the battle to right the archaic patronymic system which has acted as an instrument for the repression of the distaff side these many centuries.

*Nevertheless, true equality can never be attained so long as the male-chauvinist-pig descriptors "he" and "she" are still in use. To the truly liberated mind, a person's sex should be immaterial. Therefore I suggest the new pronoun "e." This should be used whenever any reference is made to gender, and should suffice for the nominative, objective, subjunctive, or any other case which might come up. Thus, "Wow, look at the *** on e!"*

It occurs to me as I write this that not only should a person's sex be immaterial, but e identity as well. The reader of an article may well form unfounded preconceptions merely because the protagonist's name bears unpleasant connotations for e. For example, when I read a story about a Mao Tse Tung, my mind immediately jumps to the perhaps

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erroneous conclusion the e is Chinese. Such nationalistic distinctions are not only reactionary, they're downright un-American. Since all are created equal, a simple x in place of the full name is indicated. The lower case x is chosen in preference to the upper case in accord with the constitutional edict that no titles be given; and besides, it will save ink. Since sex was dispensed with in the second paragraph, the objectionable "Mr.," "Mrs.," "Miss," and "Ms.," will also be unnecessary.

Obviously, I have merely scratched the surface with these few remarks. The astute reader will immediately see many more instances of grave injustice inherent in our language. Elimination of these barbaric anachronisms should result in the dissolution not only of all class barriers and distinctions but also of the language itself. After all, one should not lose sight of e goals.

C. H. Lewis, henceforth to be known as x in the interests of democracy.

DR. CHRIS LEWIS
4251 Satinwood Dr.
Las Vegas, NV 89117

Dear Dr. Schmidt:

Hip, hip, hooray! Three cheers and a tiger! And 47 varieties of other gleeful noises!! All of this excitement is caused by "Tools of the Trade" in the June, 1989, issue. You said it so much better than I ever could. I've been fighting the non-sexist virus for the last five or six years—and I'm tickled pink to find someone articulating what I've known intuitively. I'm going to wave that editorial in *many* faces! (I'm not trampling on the feminist movement as a whole—just on the people who take it to extremes. They should all read James Hilton's *Lost Horizon* and take the abbot's motto for their own—" . . . moderation in all things—even in moderation.") I've dealt with writers who have used every usage you mentioned, and argued with most of them that such bending of the language interferes with what they're trying to say. Most of the students and faculty types I work with will finally give in and use the impersonal he, but I *always* lose with the dedicated feminists—and I'm a woman!

I enjoyed "Ally" and "High Hotel" and, as always, Tom Easton's book reviews. I don't always agree with him, but I *do* enjoy his writing.

As a matter of "historical interest," I've been reading *Analog* since the first installment of *Dune*. My parents started reading *Astounding* before Campbell took over as editor—and in those days, they gave up something else (like a movie or lunch for a couple of days!) so they could afford it. (Money was tight in the '30s in Washington, D.C.) We now have a third generation—my niece and nephew—reading and watching science fiction in all its forms. The enquiring mind is always around, isn't it? It does tend to make you believe that humanity isn't a total loss—in spite of the doom-sayers.

SANDRA E. VADNEY
Clemson, SC

Dear Mr. Schmidt:

I'd like to take you to task—there's an interesting phrase—for dignifying an anonymous letter with an entire editorial in reply. Anonymous letters are like obscene phone calls. One ignores them.

Beyond that, those libbers who object to the use of "he" as an all-purpose pronoun are small-minded and invite ridicule of their whole movement. So, the woman (one assumes "woman") who sent that missive is not only a coward, s/he is a silly coward.

No doubt, there will be, in time, a genderless pronoun, non-indicative of

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neuter-ness, as "it" seems, but until then, we should read the message and stop taking offense at obviously unintended and unavoidable slights.

I note you say you have met "few" people who chose to be "he" or "she." Isn't it a marvelous world we live in? Fifty years ago you would have been forced to say "none."

I read *Analog* from front to back, literally, every issue, starting with your editorial. You have given me many years of pleasure, and I thank you. Don't let the bastards grind you down.

DIANE SILVER

Arleta, CA

Dear Dr. Schmidt:

In your June editorial, "Tools of the Trade," you bemoan the fact that English "does not have a separate genderless pronoun." The "he/she" battle has been going on for more years now than I care to remember, but I have yet to see anyone admit that there is a perfectly good, everyday word that fills the bill!

To quote the Second Edition of Webster's New Twentieth Century Dictionary-Unabridged:

> "it is used (a) to represent anything regarded as having no sex and in situations where sex is not specified. . . ."

It is such a common word that you used it more than twenty times in your editorial. I'm sure Ms. Le Guin used it with equal frequency in the introduction you quoted. Neither of you, however, seems to have thought of it as the answer to the problem, nor are you alone in this oversight.

I suppose that the use of this word could be objected to on the grounds that it is too impersonal, but that seems preferable to offending one's audience. Since such a perfectly good word exists, why don't we use it? I'm sure there are many reasons, but I'll leave it to the linguists and psychologists and such to argue over it.

The bottom line, fortunately or un-, is that the language is defined by the speakers, not by those who would set artificial rules of "propriety".

ROBERT E. HUBBARD

Oh yeah—the word is "it".

Sorry, but it *doesn't qualify. It specifically implies* lack *of gender, but the problem concerns beings which* have *gender which is not specified.* ■

●A cynic is not merely one who reads bitter lessons from the past; he is one who is prematurely disappointed in the future.

Sidney J. Harris

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a calendar of analog upcoming events

12-14 January
CHATTACON XV (Tennessee SF conference) on board the Chattanooga Choo-Choo. Guests—Michael P. Kube-McDowell, Robert E. Vardeman, David Cherry, Danny Gill, etc. Registration—$18 until 1 December 1989, $25 thereafter and at the door. Train—$60 flat; $85 for sleeper car suites. Info: Chattacon XV, Box 23908, Chattanooga TN 37422 (include SASE). (404) 591-9322.

12-15 January
MOSTLY EASTLY CON (media SF convention) at Holiday Inn North, Newark, N.J. Registration—$35 until 25 December 1989 (no memberships thereafter); $7 supporting at all times. Info: Joyce Yasner, 140 Cadman West, #21H, Brooklyn NY 11201. Include SASE and make checks payable to Poison Pen press.

12-15 January
SERCON 4 (literary SF conference) at Westin Airport Hotel, San Francisco, Calif. Registration—$35 until 31 December 1989, $50 at the door. Info: Sercon 4, c/o Michael Wallis, 1647 Willow Pass Rd #161, Concord CA 94520. (415) 458-9304. CIS: 74570, 1264.

19-21 January
RUSTYCON 7 (Seattle area SF conference) at Radisson Hotel, Seattle, Wash. Guest of Honor—Ben Bova, Artist Guest of Honor—Mike Grell, Fan Guest of Honor—Frank Denton. Info: Rustycon 7, Box 84291, Seattle WA 98124.

26-29 January
GENERICON VI (Rensselaer area SF conference) at Darrin Communication Center, RPI, Troy, N.Y. Guest of Honor—Barry Longyear, Special Guests—Hal Clement, Chuck & Sue Rothman. Registration—$12 in advance, $15 at the door. Info: Genericon VI, c/o RSFA, Rensselaer Union, Troy NY 12180-3590.

23-27 August
CONFICTION (48th World Science Fiction Convention) at Netherlands Congress Centre, The Hague, Netherlands. Guests of Honor—Joe Haldeman, Wolfgang Jeschke, Harry Harrison; Fan Guest of Honor—Andy Porter. Registration—$65 until 31 December 1989. Supporting—$28 until 31 December 1989. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Join now and get to nominate and vote for the Hugo Awards and the John W. Campbell Award for Best New Writer. Info: Worldcon 1990, Box 95370, 2509 CJ The Hague, Netherlands. Enclose sufficient International Reply Coupons for airmail response.

30 August-3 September
CONDIEGO/NASFiC (North American SF Convention) at the San Diego Omni Hotel International, San Diego, Calif. Guest of Honor—Samuel R. Delany, Fan Guest of Honor—Ben Yalow. Registration—$65 until 1 January 1990, $75 thereafter, $85 at the door. Info: ConDiego, Box 15771, San Diego CA 92115.

—Anthony Lewis

Items for the Calendar should be sent to the Editorial Offices six months in advance of the event.

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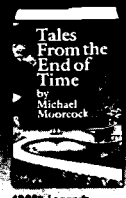

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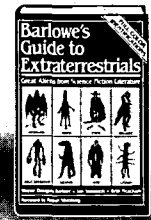

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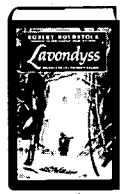

2907 Pub. Ed. $18.95
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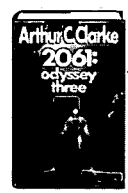

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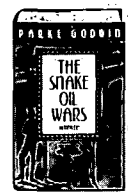

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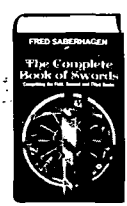

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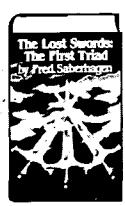
Spec. Club. Ed. $7.98



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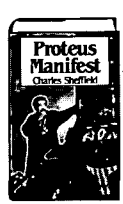

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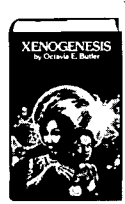

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